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# Base Exterior Architecture Plan

Naval Ocean Systems Center Hawaii Laboratory  
Oahu, Hawaii

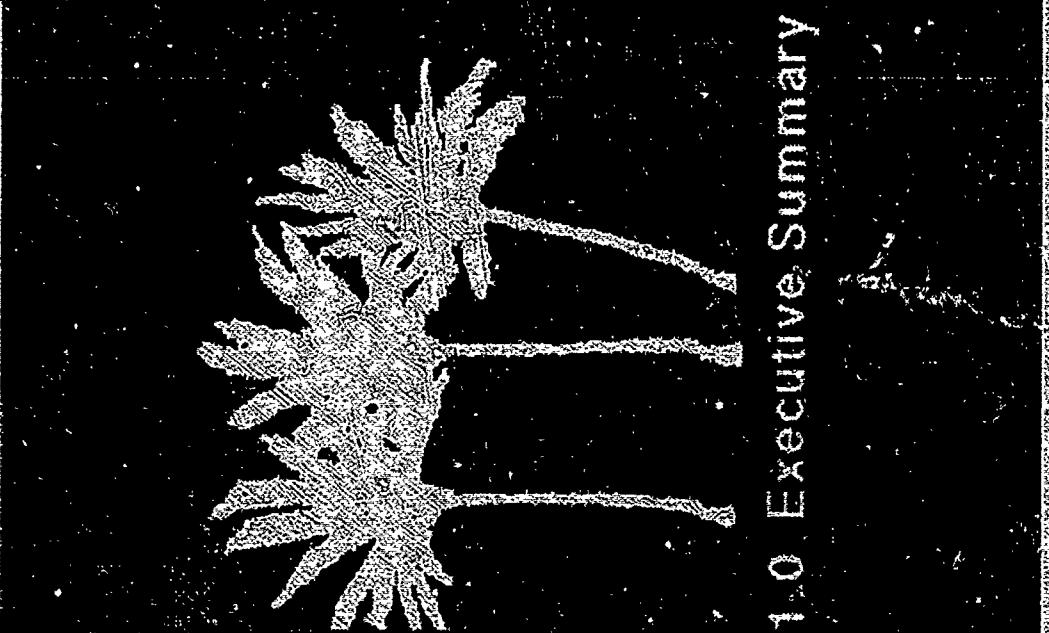
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February 1989

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## 1.0 Executive Summary

## 1.0 Executive Summary

The Naval Ocean Systems Center (NOSC), Hawaii Laboratory is located is on the northwest side of the Mokapu Peninsula overlooking Kaneohe Bay on the island of Oahu. The Laboratory occupies approximately 24 acres as a tenant of the Marine Corps Air Station (MCAS), Kaneohe Bay. This Base Exterior Architecture Plan (BEA) addresses the 22 acre main complex northwest of the MCAS West Runway.

The technical nature of the Hawaii Laboratory requires the employment of highly skilled and educated research scientists and engineers. An attractive and comfortable environment is necessary to continue to attract, motivate and retain personnel.

This BEA is directed toward the development of a functional and visually cohesive environment. Its direct focus is toward improvement of those places that are highly visible to visitors and those places that can serve as gathering, eating and recreation areas for NOSC employees.

This document includes the following sections:

**Section 2.0:** A brief introduction which describes the planning context and how the BEA guidelines are to be used.

**Section 3.0:** An inventory and analysis of the Lab exterior components and observations of design issues and opportunities.

**Section 4.0:** A description of the visual environmental theme that sets the character of the exterior environment.

**Section 5.0:** Specific design guidelines for site planning, buildings, vehicular circulation and parking, pedestrian circulation, site furnishings, signage, screening and utilities and equipment.

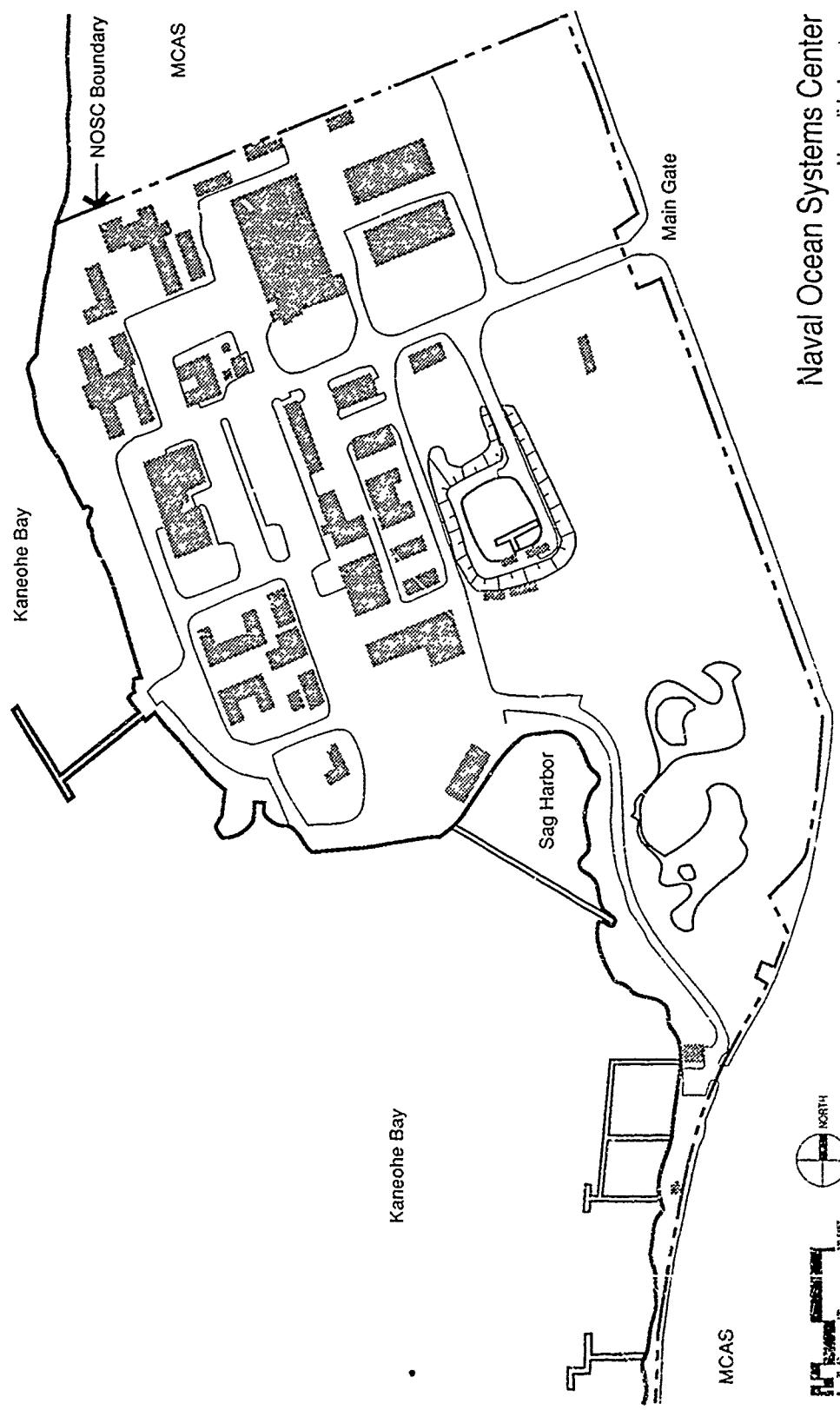
**Section 6.0:** Comprehensive design plans for six (6) site specific priority project areas as a means of demonstrating the application of the design guidelines.

**Section 7.0:** An implementation section consisting of cost projections for the priority projects and a Project Evaluation Checklist for monitoring project conformance with the design guidelines.

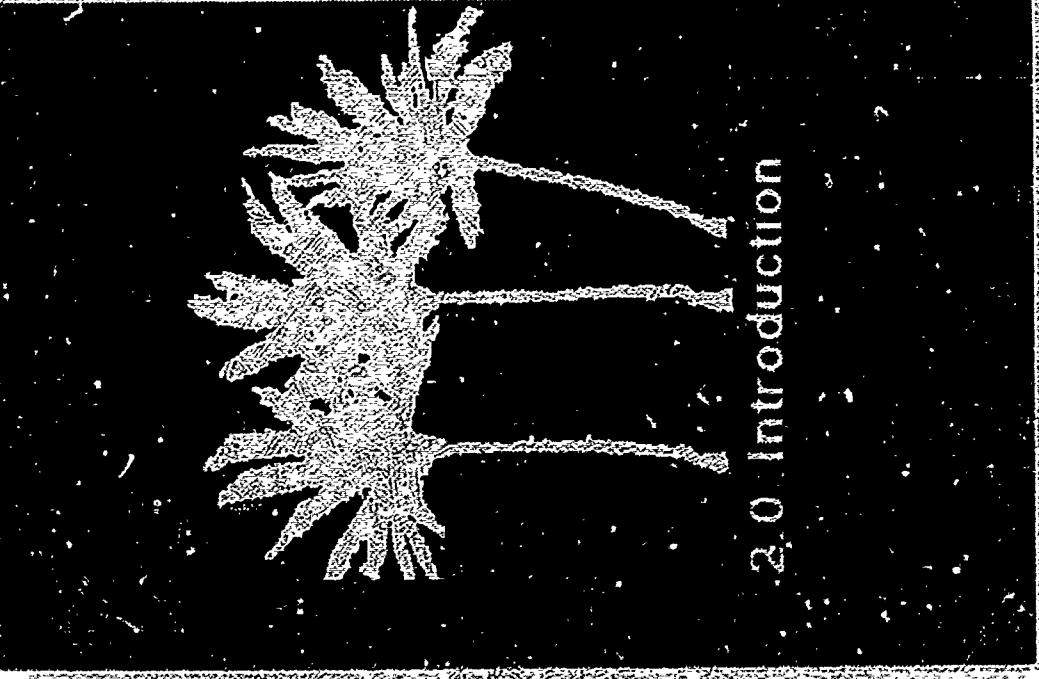


NOSC Hawaii Laboratory

The use of these design guidelines and the implementation of the priority projects will result in greater order in the built environment and simplify and coordinate development, operations and maintenance procedures. As the design guideline standards are implemented over time, they will have a positive and lasting impact on the quality of the environment at the NOSC Hawaii Lab.



Naval Ocean Systems Center  
Hawaii Laboratory

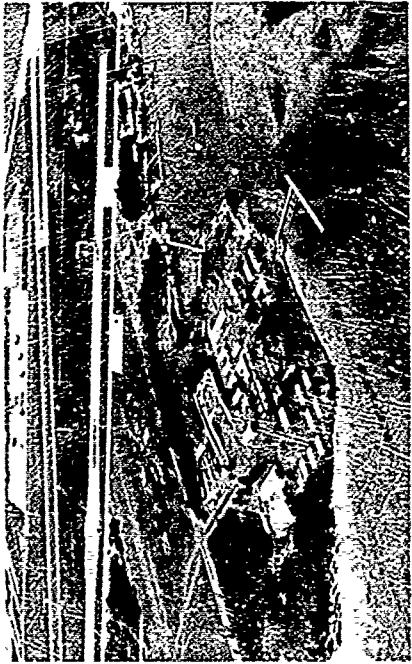


## 2.0 Introduction

## 2.1 General

### A. Purpose and Scope

This document presents a design guide for improving the function and appearance of the base exterior architecture at the Naval Ocean Systems Center (NOSC) Hawaii Laboratory. These guidelines establish specific design criteria for site planning, buildings, landscape planting, streets, parking, walkways, site furnishings, signage and other important components of the visual environment. The goal is to promote design unity throughout the Lab as a way to strengthen its image, improve its ability to recruit and retain personnel, and nurture the pride and professionalism of its people.



Aerial View of NOSC Lab

### B. Use of the Guidelines

The guidelines will be used by Government and civilian personnel, tenants, contractors, A&E consultants and others whose activities influence the appearance of the Lab. They will provide standards for new construction as well as repair and maintenance practices for the improvement of the existing exterior environment. In addition, several priority projects have been developed that illustrate the practical application of the guidelines.



Recent Addition to Facility

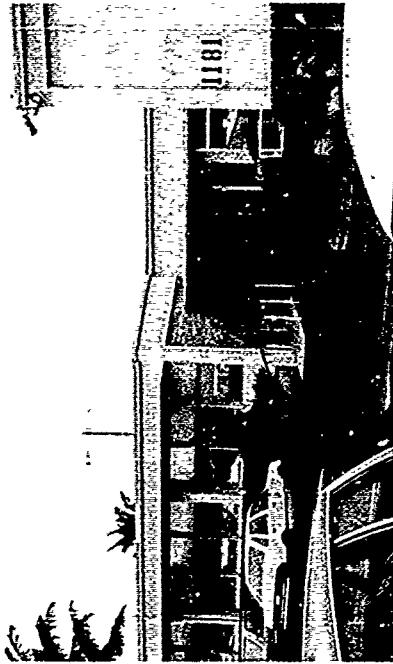
## 2.2 Planning Context

### A. History

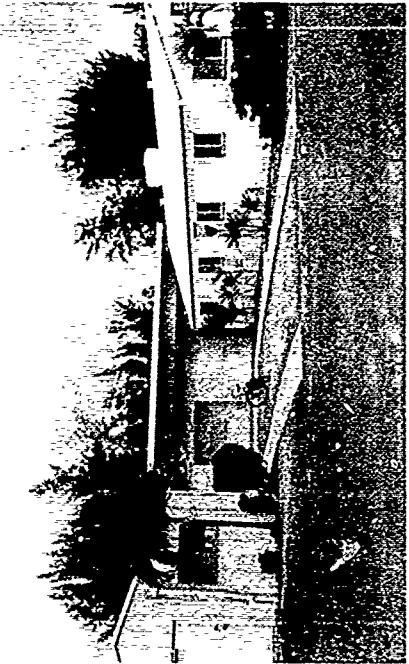
The Naval Ocean Systems Center Hawaii Laboratory, originally known as the Naval Undersea Warfare Center (NUWC), began its operations in Hangar 102 in September 1967. When the Hawaii Laboratory was officially opened in September 1968, it occupied the Hangar 102 space and 3.4 acres of adjacent land. By December 1968 the space in Hangar 102 had been expanded and two boat jiers and a 500-square-foot seaplane ramp had been added.

In August 1969, the French Battery and SAG Harbor areas were added to the Hawaii Laboratory. The West Field complex area was occupied in September 1969. Approximately 40 civilian personnel moved to Buildings 1181, 1182, and 1270 at that time. These buildings were built in 1960 to create a monitoring station for missile tests. In 1971-72, an additional 30,000 square feet of space, mostly pre-engineered buildings and high bay metal buildings, were constructed. Only buildings 1385, 1386 and 1387 were concrete masonry. Since 1972, approximately 20,000 square feet of space, consisting of pre-engineered and high bay metal buildings, have been added to the Laboratory.

In 1973, the Hawaii Laboratory's parent command's name was changed to Naval Undersea Center (NUC). The last organizational change occurred in March 1977 when NUC was merged with the Naval Electronic Laboratory Center to establish the Naval Ocean Systems Center.



Hangar 102



Administration Building

Pre-Engineered Building

**E. Natural Constraints**

Most of the 22 acre main complex (West Field area) has an elevation of only 4 feet above Mean Sea Level. The Lab is therefore susceptible to flooding from tsunamis, ocean storm waves, and rain storms.

No major hurricanes or tsunamis have occurred since 1969, although portions of the Lab sustained damage from Hurricane Iwa in 1982. The U.S. Department of Housing and Urban Development 1980 Flood Insurance Rate Map for Mokapu Peninsula indicates a 100-year flooding limit encompassing most of the Lab's buildings with inundation depths of 4 feet at the shoreline.

Storm flooding is a recurring problem at the Lab's main complex. The very flat land combined with a limited underground drainage system causes ponds to form throughout the complex following even moderate rains. Some of these ponds can persist for days hindering building access and vehicular circulation. Engineering studies are now underway to address the drainage problems.

**C. Man-Made Constraints**

There are two major man-made constraints which affect operations in the main complex area; Aircraft noise and the Explosive Safety Quantity Distance (ESQD) arc from the Combat Aircraft Loading Area (CALA).

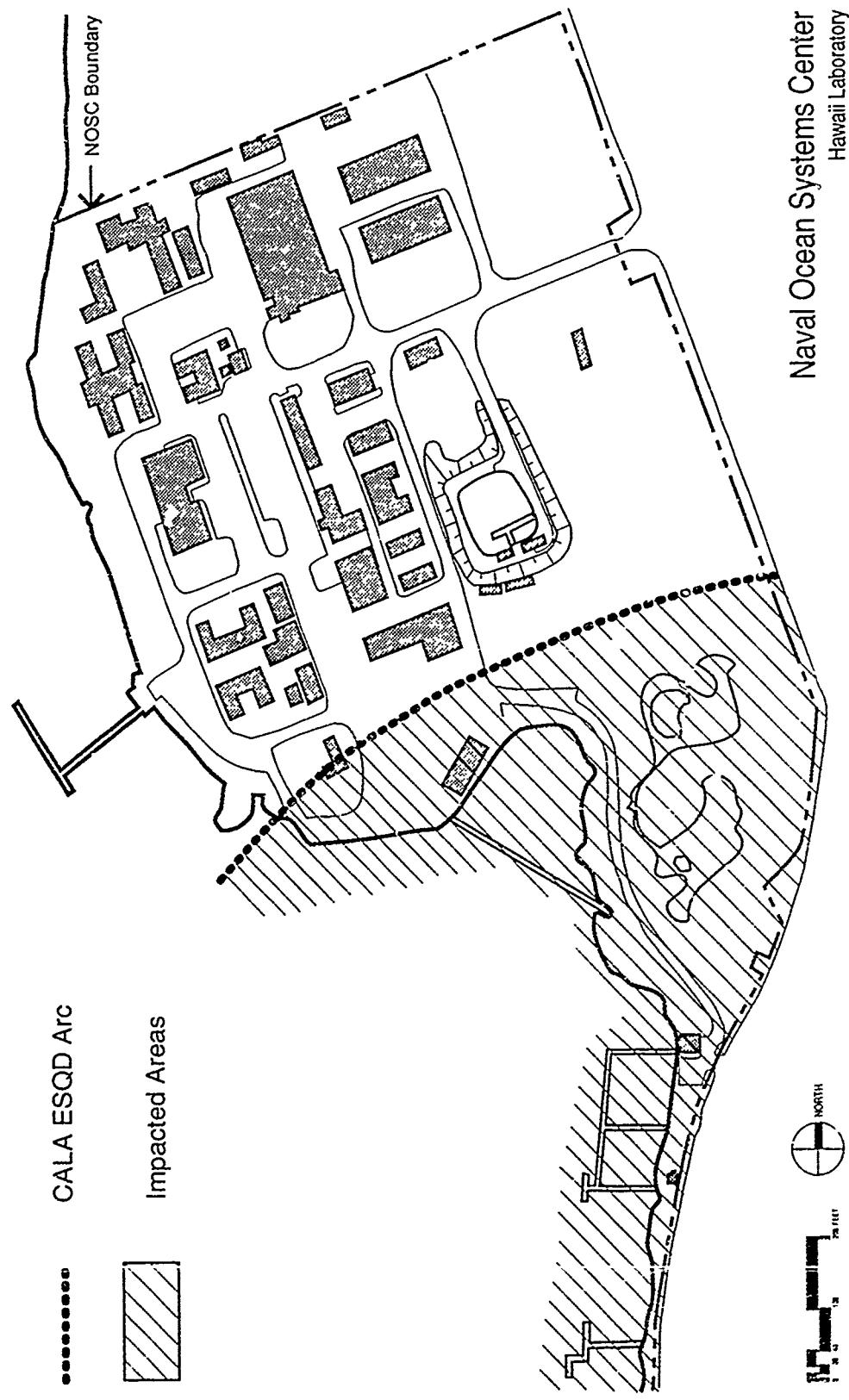
Aircraft noise in the main complex area originates from three sources: the active runway used by fixed-wing jet aircraft, the helicopter landing pad located about 1,000 feet to the north, and the engine test cell located about 2,000 feet to the southeast. According to the Master Plan for the NOOSC Hawaii Lab, completed in February 1986, current noise levels from these sources are incompatible with almost all types of activities at the Lab. The Master Plan recommends noise attenuation measures for all new construction and states that remedial reconstruction may also be warranted to address the noise problem.

The second man-made constraint affecting the main complex is the ESQD arc from the ordnance operations in the CALA at the south end of inactive Runway Five. The CALA ESQD arc extends for a radius of 1,250 feet encompassing 6.5 acres of the main complex. Safety precautions are enforced by the Lab when the CALA is active. Through a scheduling arrangement with MCAS Kaneohe Bay, the Lab announces and posts information on times the CALA will be in use. During such times, the personnel inside the ESQD arc perform only essential mammal feeding and maintenance work. Historically, the CALA has been used 11 to 14 times per year with durations of 2 to 14 days.

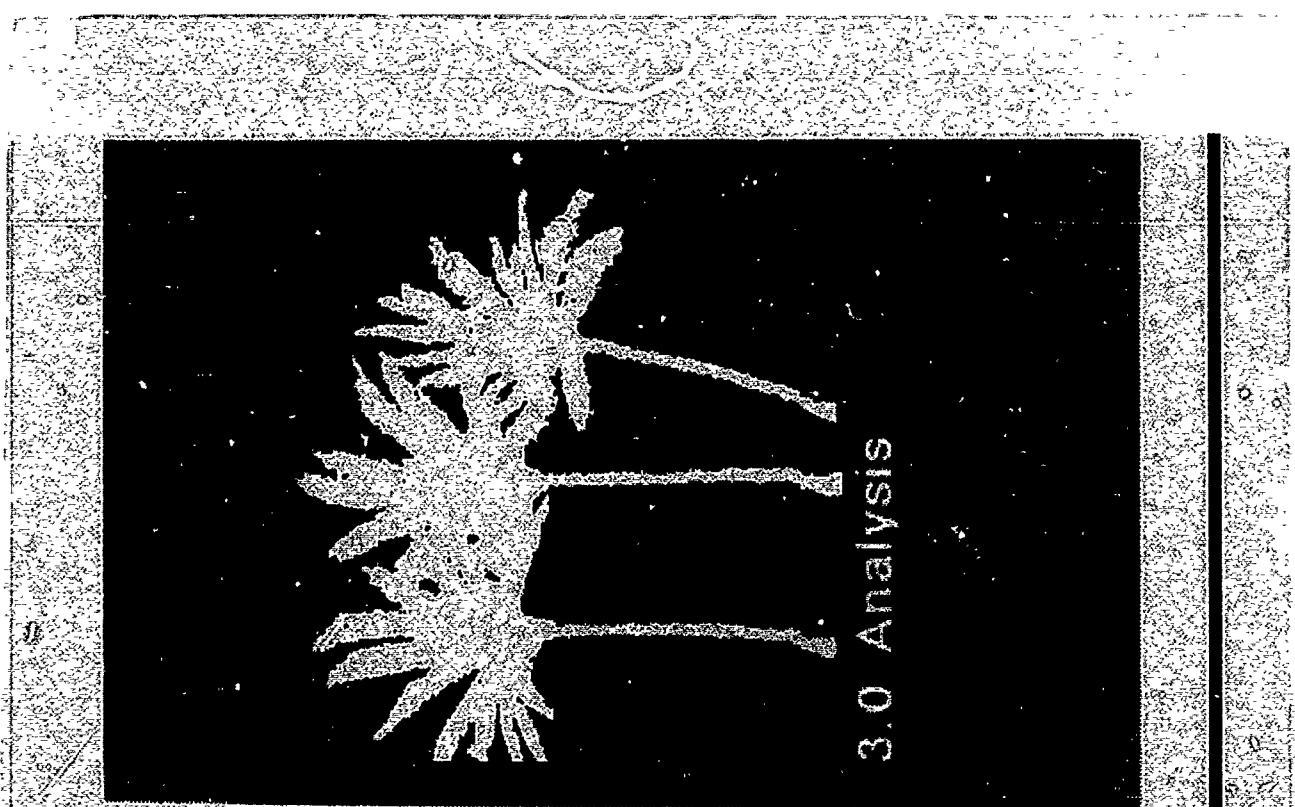


Drainage Problem

## Man-Made Constraints



Naval Ocean Systems Center  
Hawaii Laboratory



### 3.0 Analysis

### 3.1 General Impressions

After crossing MCAS Kaneohe Bay and approaching the NOSC facilities, it is very evident that the NOSC Hawaii Lab has its own sense of identity. By design the entry is very low key and does not call attention to the facility. Once in the gate, the visitor notices the low horizontal scale of the buildings within the main complex area. Although all but a few of the buildings are pre-engineered metal structures, the feeling one gets initially is that the atmosphere is pleasant and informal. Upon further investigation of exterior spaces, organized site planning is apparent, yet the informal feeling is still evident.

There are several opportunities for aesthetic outdoor spaces between the pre-engineered buildings. However, cars parked between buildings dominate these spaces. While this parking arrangement may be convenient for those who want to park near their work place, the cars detract from the character of these areas. These areas represent an opportunity lost, if used for parking. Along with removing the cars from between and immediately against buildings, the paved areas need to be reduced in visual scale and overall size. Replacing the asphalt with green space will enhance the work environment.

The high noise level generated by the adjacent Marine aircraft runway is very noticeable. The noise level is also evident when inside some of the lab buildings.

The informal character of the NOSC Hawaii Lab evokes a comfortable, free and easy atmosphere. There is good social interaction among the personnel at the facility, especially in and around the cafeteria (building 1638). Some of the exterior spaces are more aesthetic and enjoyable than others, primarily because of the abundance of plant materials in these areas. Such an example is the landscaped space between buildings 1394 and 1395. The new Teleoperator Development Laboratory building is a good example of better articulated architecture, utilizing complimentary building materials. This articulated structure relates well to the human scale and comfortably fits into its landscape spaces. All new construction at the facility should reflect these two positive examples.



Teleoperator Development Laboratory

## 3.2 Components

### A. Districts

In analyzing the appearance of the NOSC Hawaii Lab, there are several distinguishing component characteristics that contribute to the overall visual quality. Once defined and described, the effect of these components on the overall appearance can be seen more readily. The components that individually and collectively have the greatest bearing on appearance include geographical and functional districts, open spaces, nodes, landmarks, views into and from the facility, edges and boundaries, vehicular and pedestrian circulation, entries and landscape planting.

A District is an area having a common identifiable character as expressed through its geographical and architectural similarities or common function. Districts identified at the NOSC Hawaii Lab include: Administration Core / Main Plaza, Main Entry / Visitor Reception, Biosciences, Advanced Systems, Sag Harbor, Support and Storage. Three additional sub-districts that are separate from the main facilities are: French Battery, Ulupau and Hangar 102 piers. These additional sub-districts are within the main MCAS area and are not addressed in this BEA.



Cafeteria on Main Plaza

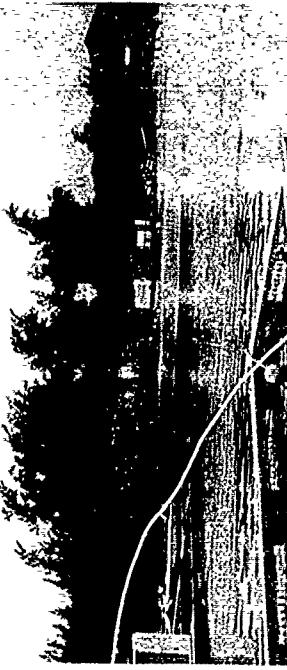
**Administration Core / Main Plaza:** This district incorporates the area between and including Building 1181 on one side and the Cafeteria Building (1638) on the other side. Building 1181 is visually prominent by virtue of being one of the few buildings at the Lab that isn't a pre-engineered metal structure. While the unique scale and architectural character of Building 1181 is an asset in terms of being easily identifiable, the building should relate better to the other buildings at the Lab, especially the Cafeteria Building which is located on the opposite side of the Main Plaza. This can be accomplished through complimentary color schemes and by incorporating a system of covered walkways and coordinated plantings between buildings.

**Main Entry / Visitor Reception:** This district includes the Main Entry Gate and the corridor terminating at the Visitor Reception Building 3093. The location of Building 3093 is an asset in that this is one of the first buildings seen by visitors to the Lab. However, with the building entry on the south side away from the main road, the entry needs to be better identified and defined. This can be accomplished through selective screening, accent planting and signage.

**Biosciences:** This district includes the Lab facilities associated with marine mammal and biological science studies. Buildings 1387, 1336, 1385, 1620, 1640, 1372 and 1393 are the primary buildings in this area. Included also in this district are direct support functions such as the diving lockers and marine mammal pens. Parking in this area needs to be reorganized and controlled to prevent vehicles from being parked between or immediately adjacent to buildings. A system of covered walkways or arcades would help to relate the individual buildings together and would form a cohesive group. Planting of trees and shrubs should be organized to accent entries, frame aesthetic views and screen objectionable views.

**Advanced Systems:** This district includes all of the buildings on the north side of the main access road from Building 1652 on the east side to Building 1394 on the west side. This is a functional district incorporating facilities involved in research and development of advanced systems such as fiber optics, ocean surveillance, artificial intelligence and advanced weapons systems. While open paved areas are necessary around the machine shop and assembly buildings, the paved areas between Building 1170 and Building 1396 should be reduced. This can be accomplished by reorganizing the parking so that there is planting between the cars and the buildings.

**Sag Harbor:** This is a geographic district including the marine mammal pens and other facilities in and around Sag Harbor. Development in this area is restricted due to its location within the Explosive Safety Quantity Distance (ESQD) arc of the Combat Aircraft Loading Area (CALA) for MCAS Kaneohe Bay.



Sag Harbor



Biosciences District

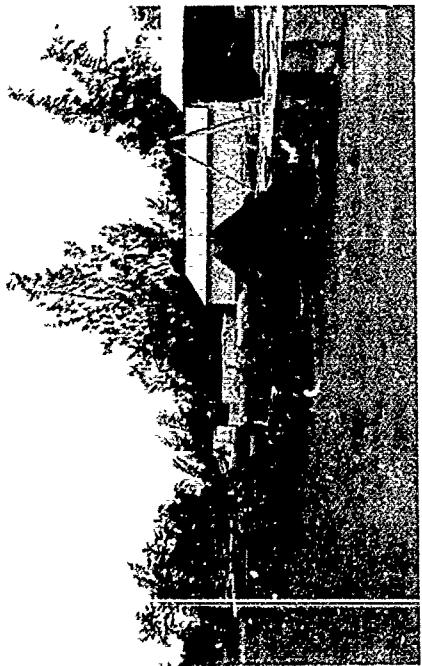
**Support:** This district includes the high bay Buildings 1623 and 1388, as well as, the boat works area between. This is a functional district which primarily services and maintains the boats used in the water activities work at the Lab. This area has a cluttered look. To relieve this situation, all materials and equipment not currently in use should be stored in another designated long term storage area, such as the open space area north of the main gate. Boats and boat trailers should be assigned to marked and organized parking areas.

**Storage:** This is a functional district primarily related to storage of materials and equipment used at the Lab. Usable materials and equipment should be stored and arranged in as orderly a manner as possible. Unusable and waste materials should be removed from the site. Views into storage areas should be screened and stonning of materials should be concentrated in designated storage areas only.

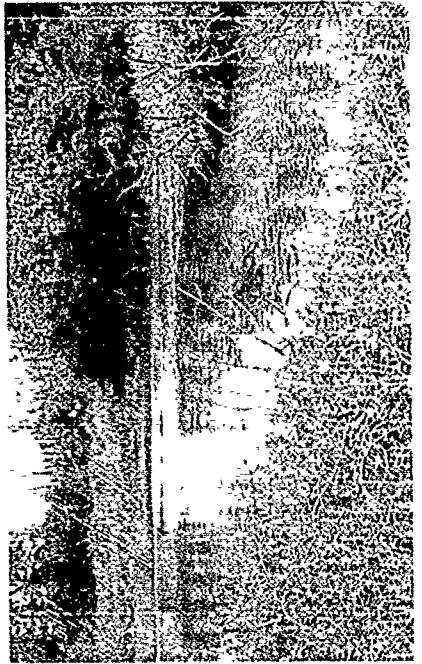
## B. Open Spaces

**Open spaces:** This district includes the high bay Buildings 1623 and 1388, as well as, the boat works area between. Open spaces are vacant areas that are formed by natural features or by man made development as the open areas between buildings. There are three major open space areas at the NOSC Hawaii Lab. These are the Ecology Ponds area between Perimeter Road and Sag Harbor, the undeveloped area north of the Main Gate and the Bay Front lawn area behind Building 1181.

**Ecology Ponds:** This area consists of extensive wetland vegetation and two ponds that were used for ecological studies. The vegetation is seen as a positive attribute which separates the NOSC facilities from the MCAS runway, both physically and psychologically. Further development of the area will be impacted by the CALA ESQD arc which encompasses the majority of the open space around the ponds.

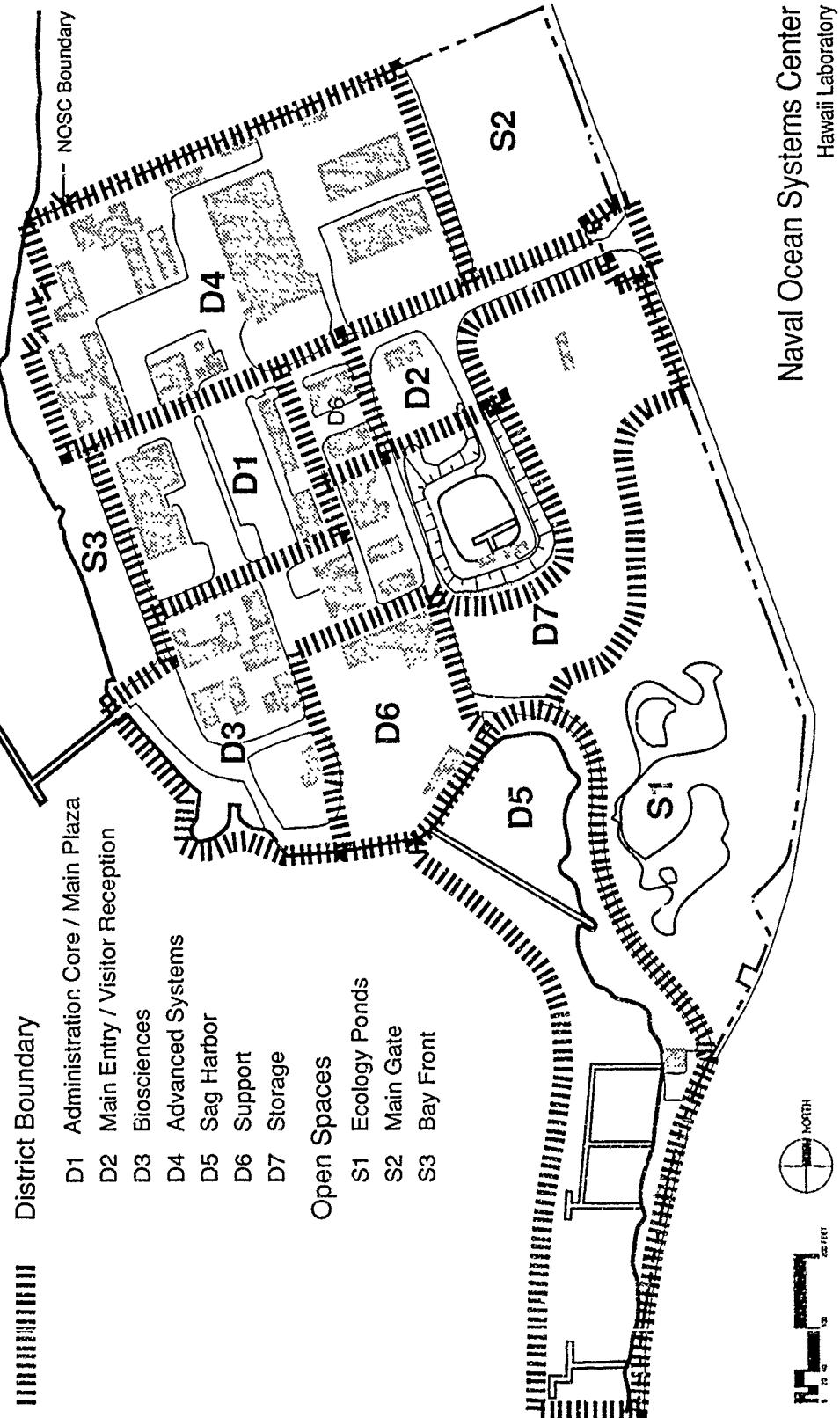


Storage Area



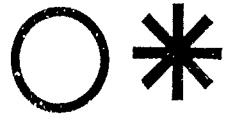
Ecology Ponds

## Districts / Open Spaces



Naval Ocean Systems Center  
Hawaii Laboratory

## Nodes / Landmarks



Nodes

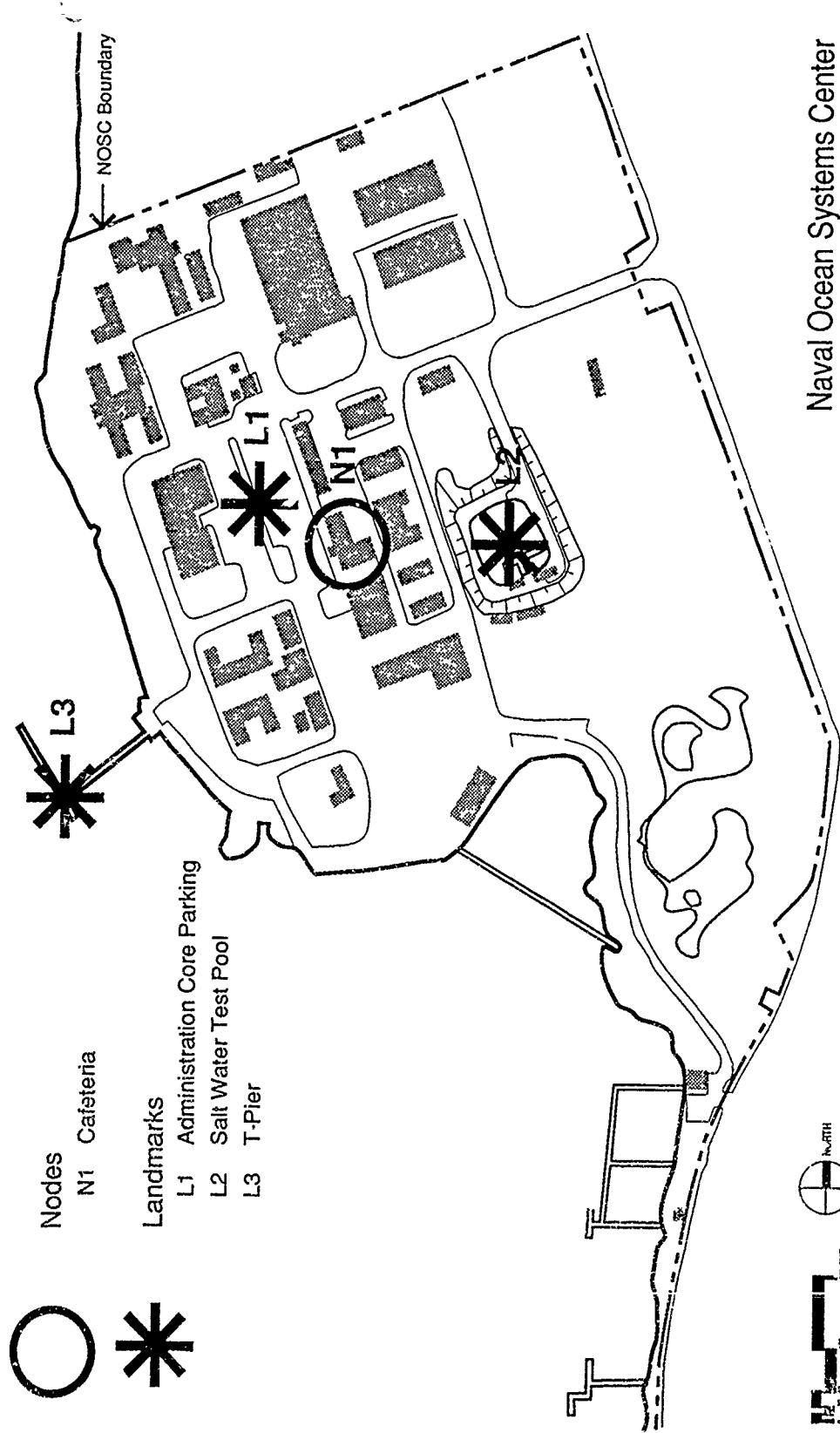
N1 Cafeteria

Landmarks

L1 Administration Core Parking

L2 Salt Water Test Pool

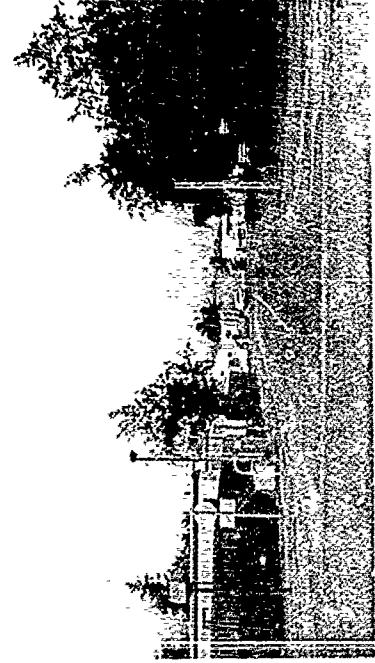
L3 T-Pier



Naval Ocean Systems Center  
Hawaii Laboratory

### C. Nodes

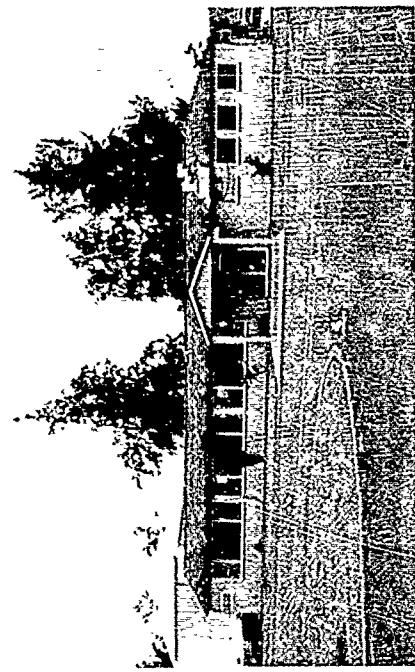
Nodes are generators and collectors of activity, those places at the Lab where people actively collect. The primary activity node at the NOSC Hawaii Lab is the cafeteria, Building 1638. There is one other less important node near the cafeteria and that is the shower and restroom Building 1387.



Main Gate

**Main Gate:** The area to the north of the main gate consists of extensive vegetation that screens most views into this area. As an open space, this area is an asset in that it is a separation between the MCAS runway and the NOSC facilities. Projected use of the area is for storage. The vegetation along the main access road and perimeter fence should be retained as a visual screen

**Bay Front:** The lawn area between Building 1181 and Kaneohe Bay is a tremendous asset as an open space. The simple plantings of coconut palms and lawn frame the view of the bay. However, the concrete box way attenuators along the water's edge are in disrepair and need to be filled with soil and planted to further enhance the visual quality of this area.

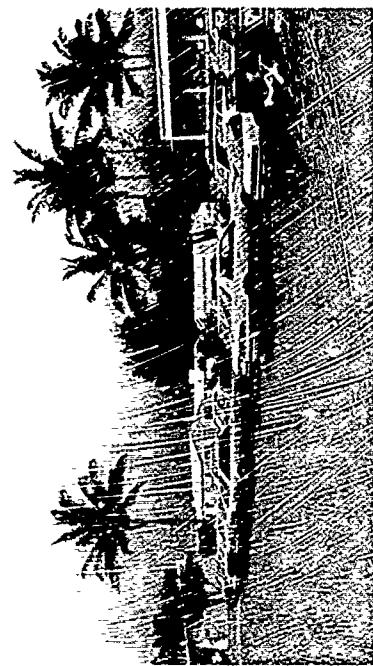


Cafeteria

## D. Landmarks

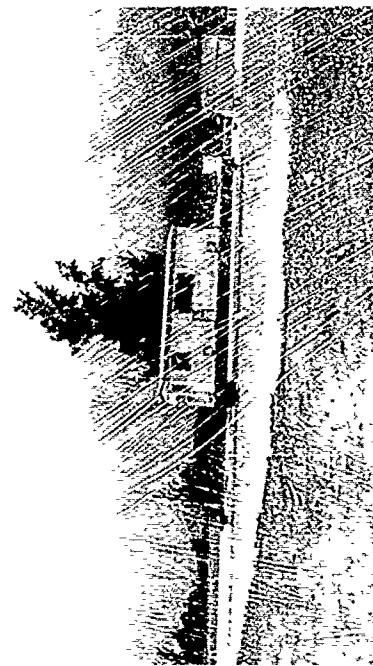
Landmarks are prominent, distinctive and memorable visual features. Landmarks help people identify an area or orient themselves. The NOSC Hawaii Lab has three landmarks: The Administration Core Parking, the Salt Water Test Pool and the T-Pier.

**Administration Core Parking:** The main parking area acts as a "commons area" and most facilities are organized about its axes. This is an important landmark as most people would park here and/or circulate through this area often. Planting should be incorporated into this area to soften its appearance and to provide shade for parked cars.



**Salt Water Test Pool:** Because of its mounded elevation, the Salt Water Test Pool is visible from most locations within the main complex of the Lab. While it serves as a valuable orientation landmark, the appearance of the supporting slopes of the test pool are seen as a liability. The slopes around the pool need to be planted to improve the appearance and mitigate soil erosion potential.

Administration Core Parking



Salt Water Test Pool

**T-Pier:** Kaneohe Bay is a very important orientation feature at the Lab. The existing T-Pier extending out into the bay is a distinctive orientation landmark. Once visitors can see the pier, they can orient themselves within the main complex area.

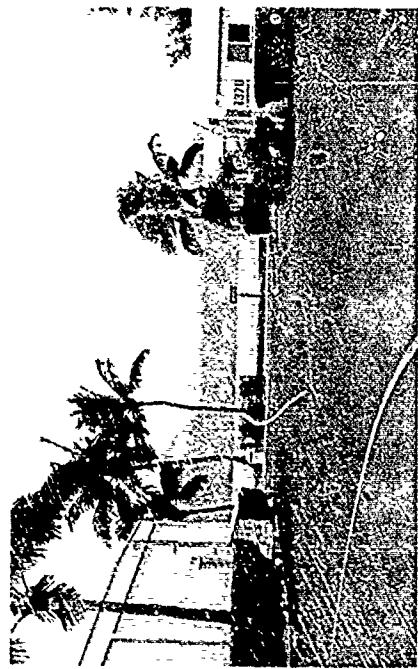
## III. Views

There are numerous view opportunities out to Kaneohe Bay from various locations throughout the Lab site. Some of the major view opportunities occur at the cafeteria Building 1638, on the axis of the main entry road and from the bay front open lawn area behind Building 1181.

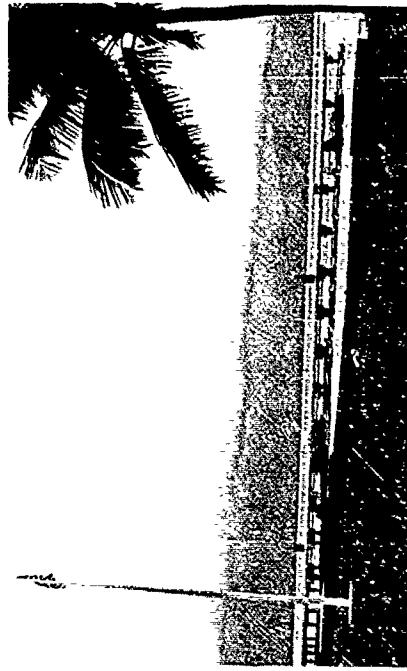
The view out to Kaneohe Bay from the cafeteria is spectacular. It is comprised of a view corridor down the road between Building 1181 and Building 1393. Existing coconut palms frame the view and add interest. All trees in this view corridor should be trimmed up to a minimum height of six feet. However, the topiary Casuarina in the bay front lawn area and the Pittosporum adjacent to Building 1387 should be removed to further enhance the view.

The view down the main access road is framed by buildings on both sides and has Kaneohe bay as its terminus. The view is presently interrupted by a one way sign on a single post at the end of the road. Since the intersection drive is not actually a one way road, the sign should be removed to enhance the view.

The bay front lawn area west of Building 1181 has a panoramic view of Kaneohe Bay. The concrete box wave attenuator wall in the foreground detracts from the view. With some soil filling the lawn area can be rolled up gently to the same grade as the top of the boxes to reduce their visual impact.



View Down Main Access Road



Kaneohe Bay

## F. Edges and Boundaries

There are two types of edges or boundaries at the NOSC Hawaii Lab, natural and man-made. The natural boundary is the water of Kaneohe Bay. Along this edge is a wave attenuator wall constructed of concrete box sections. These boxes are in some disrepair and therefore are seen as a visual liability. To change this, the concrete should be repaired where damaged, then a filter mat placed in the boxes and backfilled with soil. The boxes can then be planted to soften their appearance.

The man-made edges are the boundary fences along the east and north sides of the site which separate NOSC from MCAS Kaneohe Bay.

## G. Circulation

The two main types of circulation at the NOSC Hawaii Lab are vehicular circulation via roads or parking areas and pedestrian circulation via walkways or roads. Generally, the image of the environment is influenced most directly by the views from roads as one passes through a given area. Movement along roads causes a succession of perceptions and experiences that are related in time and space.

The two-lane, main entry road is the only road with sufficient traffic volume to be considered a primary road. The views from the main entry road can be controlled to help visitors better orient themselves to the site and to create a pleasant impression. Plant material and fences or walls should be used to screen undesirable views of storage areas and to direct views to important features, such as the visitor/security building and Kaneohe Bay.



Concrete Box Edge



Looking Out of Main Entrance

## I. Landscape Plant Material

When landscape plant material is selected and placed in a thoughtful manner, it softens the appearance and improves the function of the built environment. The consistent, conscientious use of plants will unify and provide a sense of order to the NOSC Hawaii Lab's exterior spaces.

The initial impression generated by the existing landscape plant material at the Hawaii Lab is that the plantings are sparse and sporadic and often in the wrong location to be effective. There are several existing mature specimens that are seen as real assets, in particular the Coco-nut Palms, and these should be retained. A comprehensive landscape master plan which utilizes the existing vegetation and incorporates the organized planting of new trees and shrubs is urgently needed to insure a quality environment for both staff and visitors.



Main Entry

## H. Entries

All visitors to the NOSC Hawaii Lab must pass through the main entry gate. The approach to the gate is rather austere and understated and does not announce the facility beyond. The low key appearance is intentional so as not to call attention to the Lab or its activities. Unfortunately the austere theme is carried on beyond the main gate and down the main entry road. More accent planting is needed to make a stronger entry statement in the area between the gate and the visitor / security building.



Coconut Palms

### 3.3 Appearance Summary

The NOSC Hawaii Lab has its own sense of identity. The site is remote, unique and in several ways spectacular. The low horizontal scale of the buildings create an informal and unpretentious setting. There seems to be a very relaxed island atmosphere that prevails. The Lab personnel, to their credit, have been undertaking a comprehensive painting program for the existing buildings. The use of a consistent and coordinated color scheme has done much to improve the general appearance of the Lab. However, there still exist some appearance shortcomings that detract from the positive features of the Lab and its site.

Key appearance shortcomings are listed here:

1. **There is too much paving:** Several large paved areas with no planting dominate the site. Paved areas between buildings create a bleak, glaring appearance. Cars parked between buildings add to the visual confusion and clutter.
2. **Unsightly storage areas:** Haphazardly stored materials and equipment need to be better organized and screened from view. Unusable stored materials, trash and accumulated debris should be removed from the site.
3. **Disparate, unrelated appearance of buildings:** Large numbers of small buildings of diverse function need additional unifying elements in conjunction with painting scheme, to tie buildings together.
4. **Sparse and sporadic landscaping:** Planting needs to be upgraded to soften or screen buildings, parking areas, storage areas, open spaces and to accent entrances and special features.
5. **View Enhancement:** Several spectacular views need enhancement and elements which detract from these views need to be eliminated.

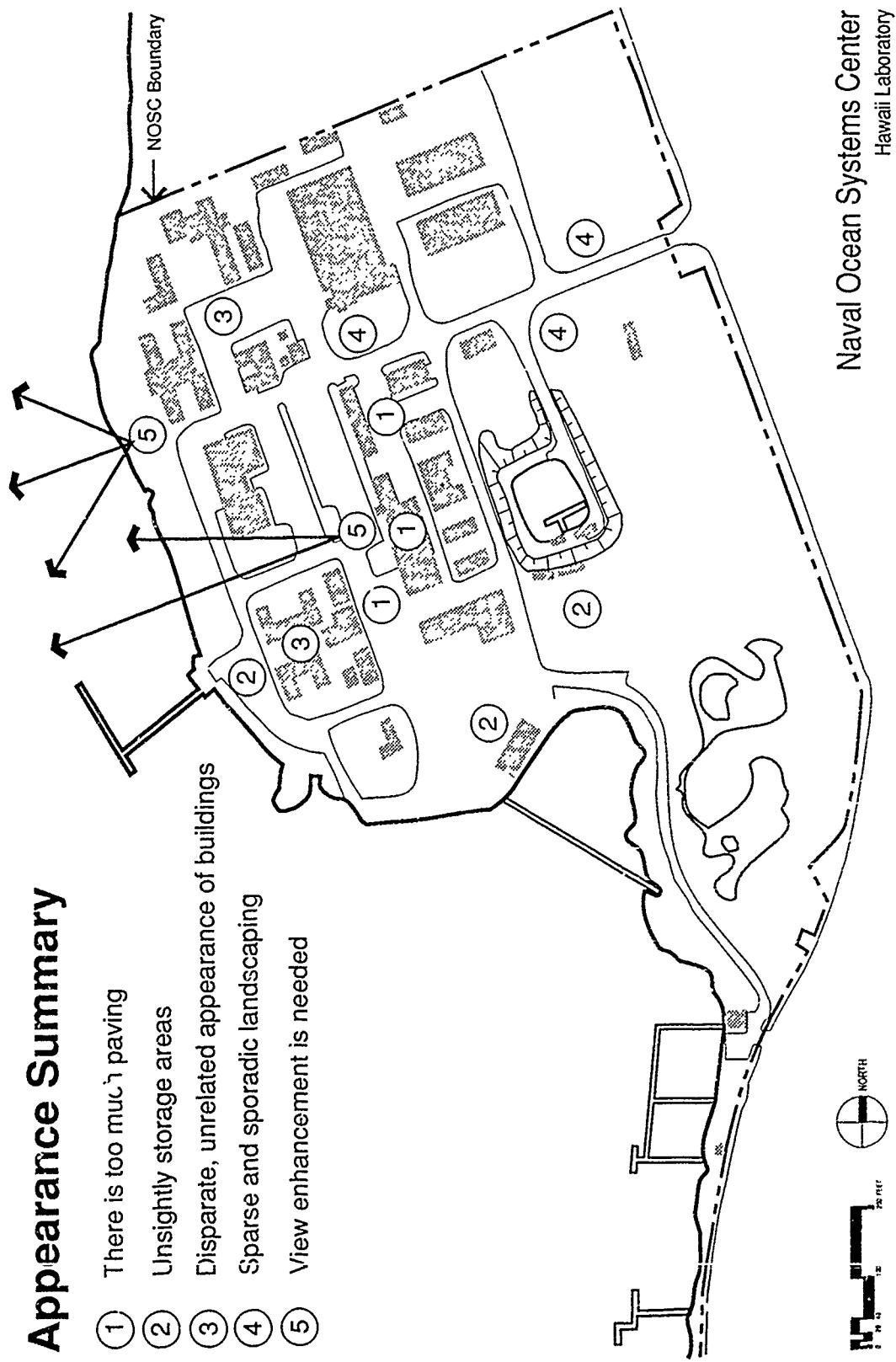


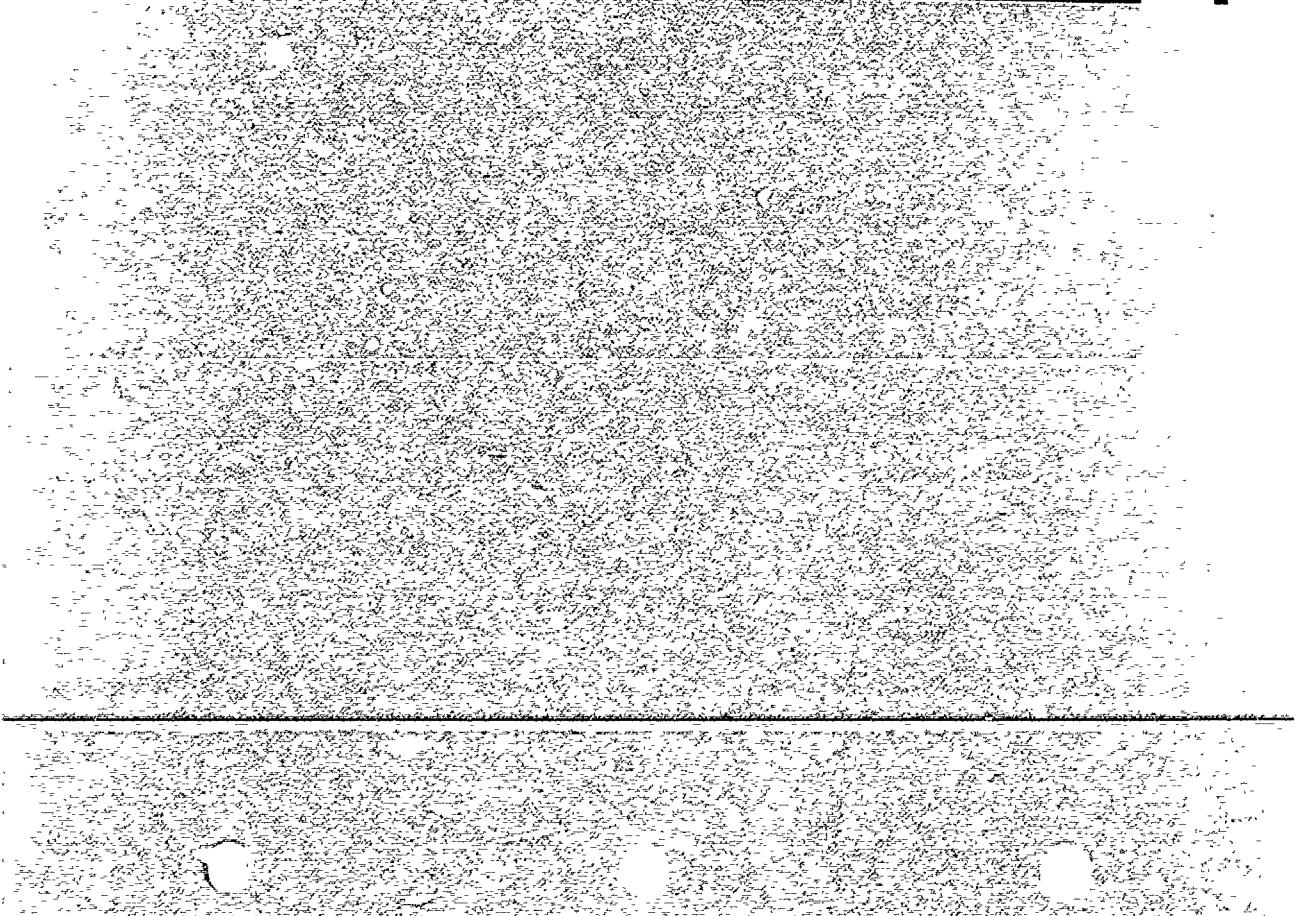
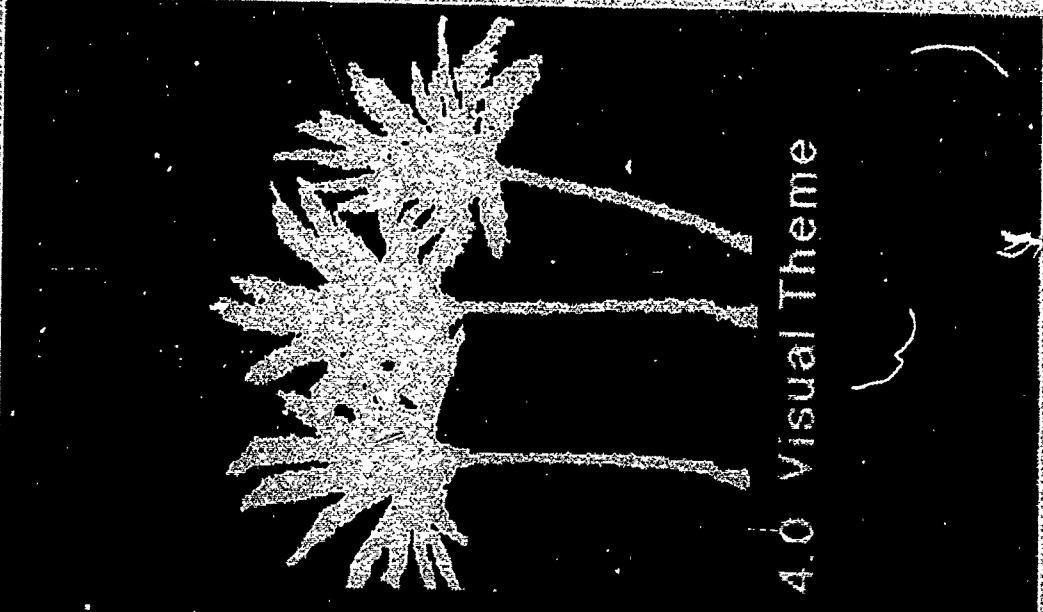
Main Parking Area

The following sections of this guide will define the theme and priority projects that will ultimately give the NOSC Hawaii Lab a distinct character and mitigate the shortcomings identified in this appearance summary.

## Appearance Summary

- ① There is too much paving
- ② Unsightly storage areas
- ③ Disparate, unrelated appearance of buildings
- ④ Sparse and sporadic landscaping
- ⑤ View enhancement is needed





#### 4.1 Theme

The NOSC Hawaii Lab is a research and development center employing a select group of scientists and engineers whose mission is to conduct scientific research, including such activities as testing and evaluation for command control, communications, ocean surveillance and undersea weapons systems; all of which is vital to the continued development of Naval strength and sophistication.

The objective of the theme is to enhance, with maximum effect for minimum effort, the character of the base exterior in a manner compatible with its function and its natural environment. To achieve this objective, an Island Village theme for the NOSC Hawaii Lab makes use of coordinated materials, colors and forms that, consistently applied, convey feelings of informality, vitality and inspiration.

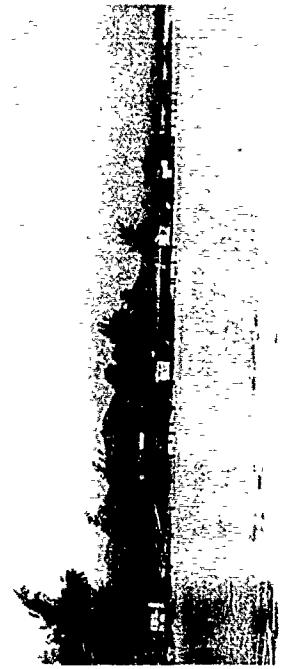
The geographic setting of the NOSC Hawaii Lab is unique. Many of the features of the Lab currently are compatible with the Island Village theme. Care must be exercised so as not to over simplify or standardize every element at the Lab, or "Island Fever" and disinterest will be encouraged. Along with implementing the design guidelines it is important to provide elements that indicate changes of season, flower color and interest.

#### 4.2 Application of the Theme

The theme for the NOSC Hawaii Lab establishes the desired visual appearance and generally defines the characteristics of its component parts. The design guidelines and priority project examples that follow provide specific interpretations of the theme.

Certain components of the visual environment, such as signs and site furnishings, lend themselves to standardization. These standardized components should be used throughout the lab, without modification, as directed by the guidelines.

Other components, such as site planning and landscape planting, cannot be standardized because each situation is unique and warrants individual consideration. For these situations the guidelines provide guidance rather than hard and fast rules. By applying the theme and its interpretation through the guidelines, over time, visual cohesiveness of the entire Lab facility will be achieved.



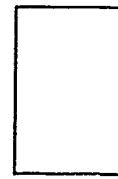
Island Village Setting

### 4.3 Color Schedule



**Bronze Olive** Fed. Std. #24255

Use: Small ancillary structures



**White** Fed. Std. #27722

Use: Field



**Ebony Black** Fed. Std. #27038

Use: Small ancillary structures



**Light Blue** Fed. Std. #25240

Use: Doors and Accent



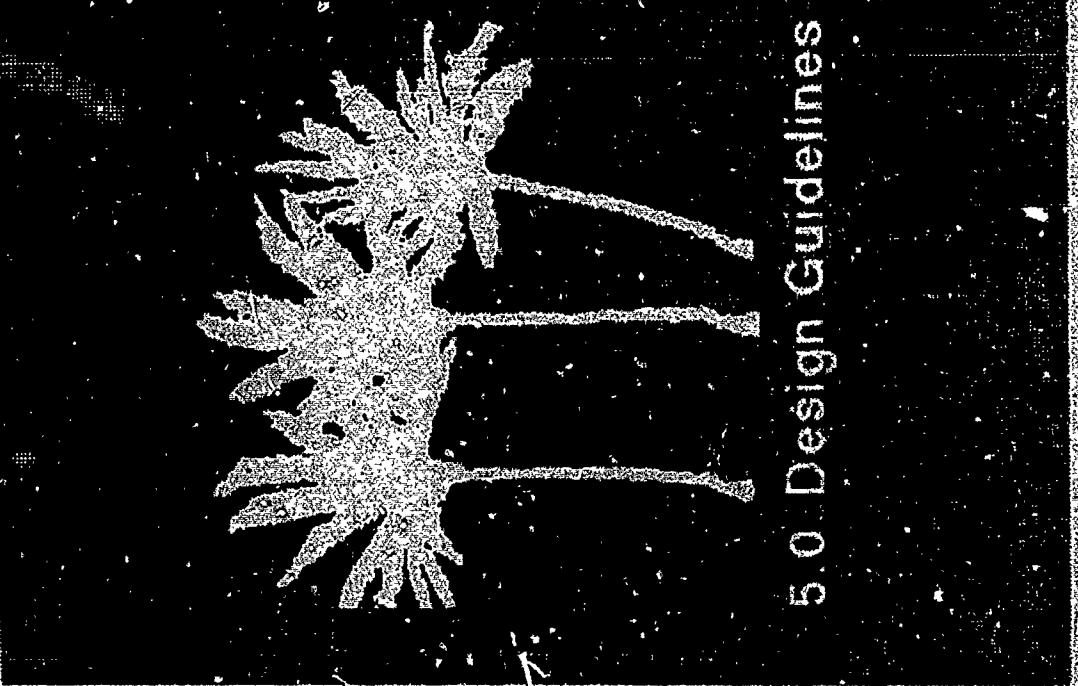
**Gray** Fed. Std. #26373

Use: Trim and Screen Fences



**Dark Blue** Fed. Std. #25050

Use: Special Signage



## 5.0 Design Guidelines



## 5.0 Design Guidelines

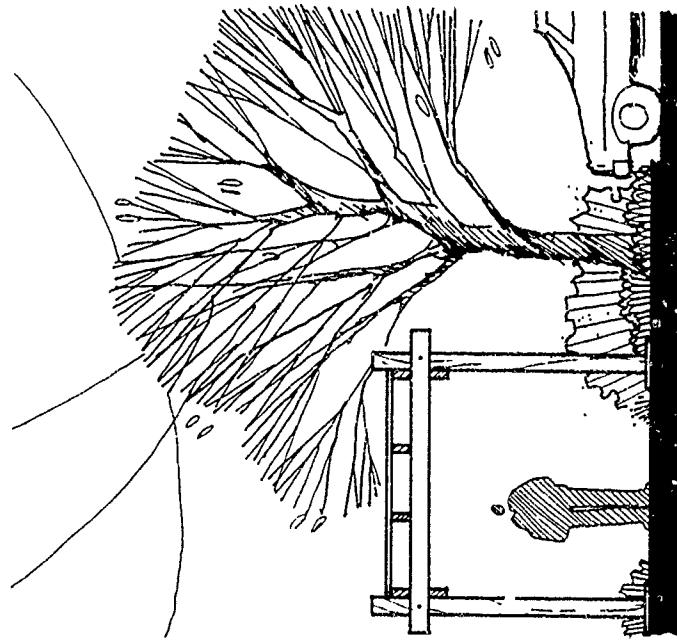
The location, design and maintenance of the components of the NOSC Hawaii Lab's exterior environment affect its function as well as its appearance. If the components are functional, orderly and harmonious with one another and their surroundings, the Hawaii Lab will support its mission and engender pride and professionalism among its personnel.

In this section, design guidelines are established for buildings / site planning, landscape planting, vehicular circulation / parking, pedestrian circulation, signage, screening, site furnishings and utilities and equipment. These guidelines will be used by military and civilian personnel who are responsible for the general planning, implementation and maintenance at the Hawaii Lab, as well as A&E firms that plan and design specific individual projects.

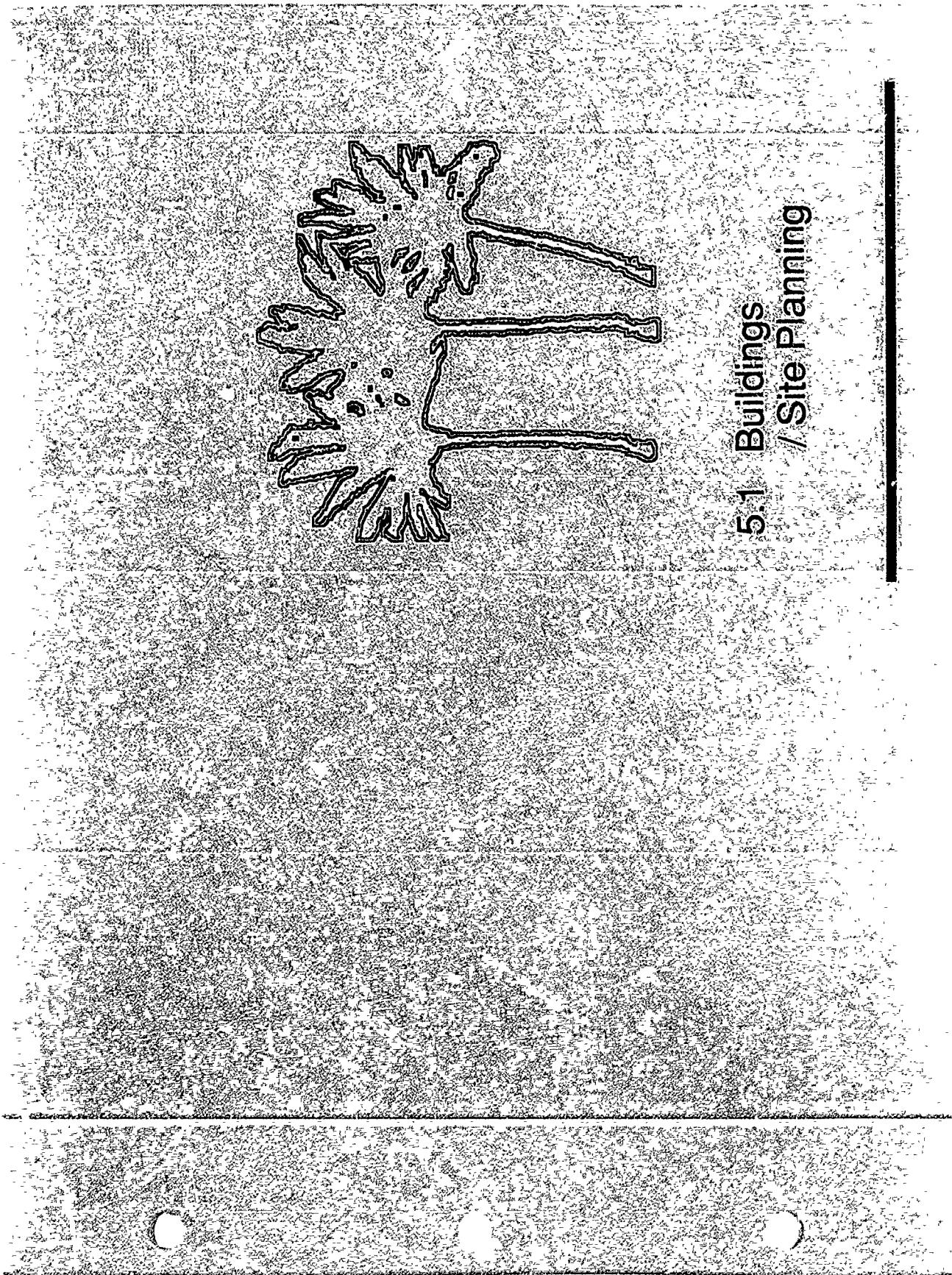
Many components of the exterior environment, such as signage, site furnishings and utilities, lend themselves well to standardization. Guidelines for such components should be applied without modification.

Other components, such as buildings, site planning and landscape planting, cannot be standardized easily because each situation is unique and warrants individual consideration. Guidelines for these types of components provide design direction and should be used to achieve the desired measure of continuity.

The NOSC Hawaii Lab does not currently anticipate nighttime use. And therefore, guidelines for site lighting do not occur in this document.



## 5.1 Buildings / Site Planning



## 5.1 Buildings / Site Planning

### A. Introduction

To a large extent, the image of the NOSC Lab is determined by the buildings. Architectural style and character along with grouping, massing and siting of buildings contribute to the overall impression of the Lab's exterior environment. Well designed buildings that are properly sited and unified by common elements of architectural detail and a coordinated color scheme can convey a sense of order and organization. Buildings can be oriented and massed to conserve energy, taking advantage of prevailing breezes and sun.

### B. Objectives

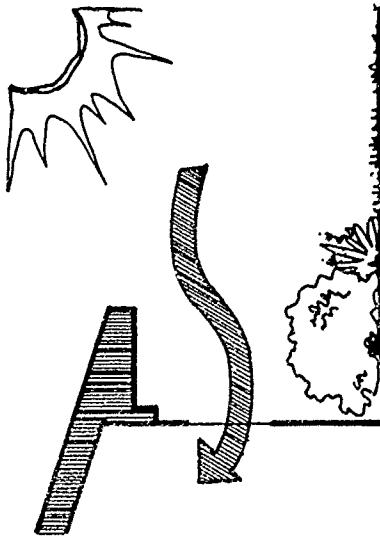
**Insure compatibility with existing development**  
Establish linkages between new and old development by generally maintaining the low-scale, single-story character of the existing buildings.

**Upgrade overall appearance**  
Renovate existing buildings using painting and maintenance to achieve basic design improvements and unity of appearance.

**Maximize efficient use of available land area**  
Group similar uses together.

**Insure compatibility with natural factors**  
Establish design parameters for new construction that are energy efficient, cost effective and compatible with site environmental factors.

### C. Guidelines



**Climate Control**

**Site Planning**  
Orient buildings, especially entrances, to take into consideration wind control, to minimize heat gain and to maximize desirable views.

**Group similar uses together, and separate incompatible uses such as stored materials and outdoor eating.**

**Building Architecture**  
For new buildings, provide better fenestration and articulation of exterior walls.

Screen mechanical equipment on existing buildings; on new buildings, locate equipment on roof if possible.

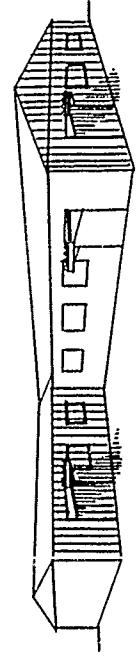
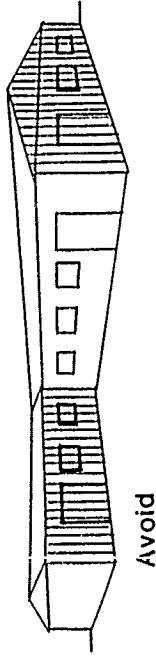
Continue to implement the building painting program.

Provide covered walkways to better tie buildings together. (see section 5.4 "Pedestrian Circulation" for detail of covered walkway)

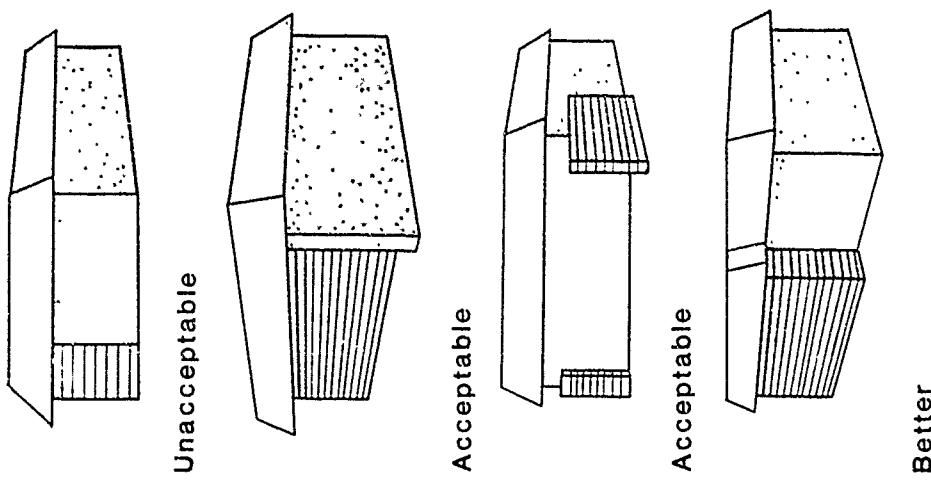
#### D. Building / Site Planning Process

A site analysis, site plan and character studies should be prepared for each site prior to development.

1. **Site Analysis** - Prepare a site analysis diagram for the site and its environs. A thorough site analysis will identify the critical factors to which the development must respond for the most desirable fit between the project and the site. Factors to consider include access, views, sun, wind, utilities and adjacent structures or conditions.
2. **Site Plan** - Prepare a site plan that illustrates each component of the proposed project including buildings, roads, parking, walks, screening, utilities, and landscaping. Planting utilizing these design guidelines. Arrange compatible buildings in groups when possible, creating introspective or extrospective courtyard spaces between.
3. **Character Studies** - Prepare sketches, elevations and sections of the buildings and site development in order to communicate the intended character of the proposed plan. Sketches and drawings should indicate all building materials and finishes. Changes in materials should reflect changes in elevation or plan view. Use the character studies to compare the mass or overall bulk volume of the proposed structure to that of adjacent buildings to insure compatibility.

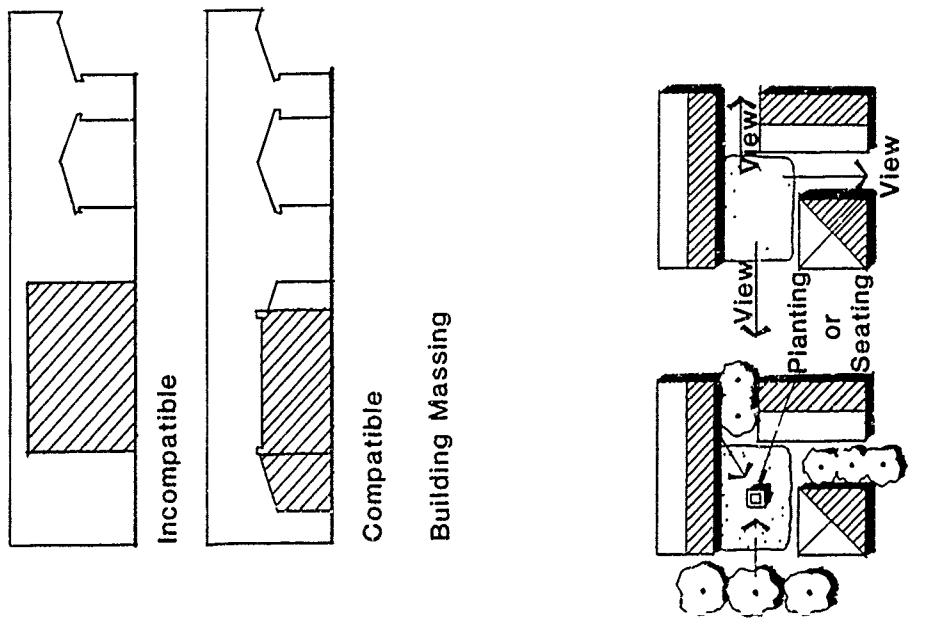


#### Building Entries

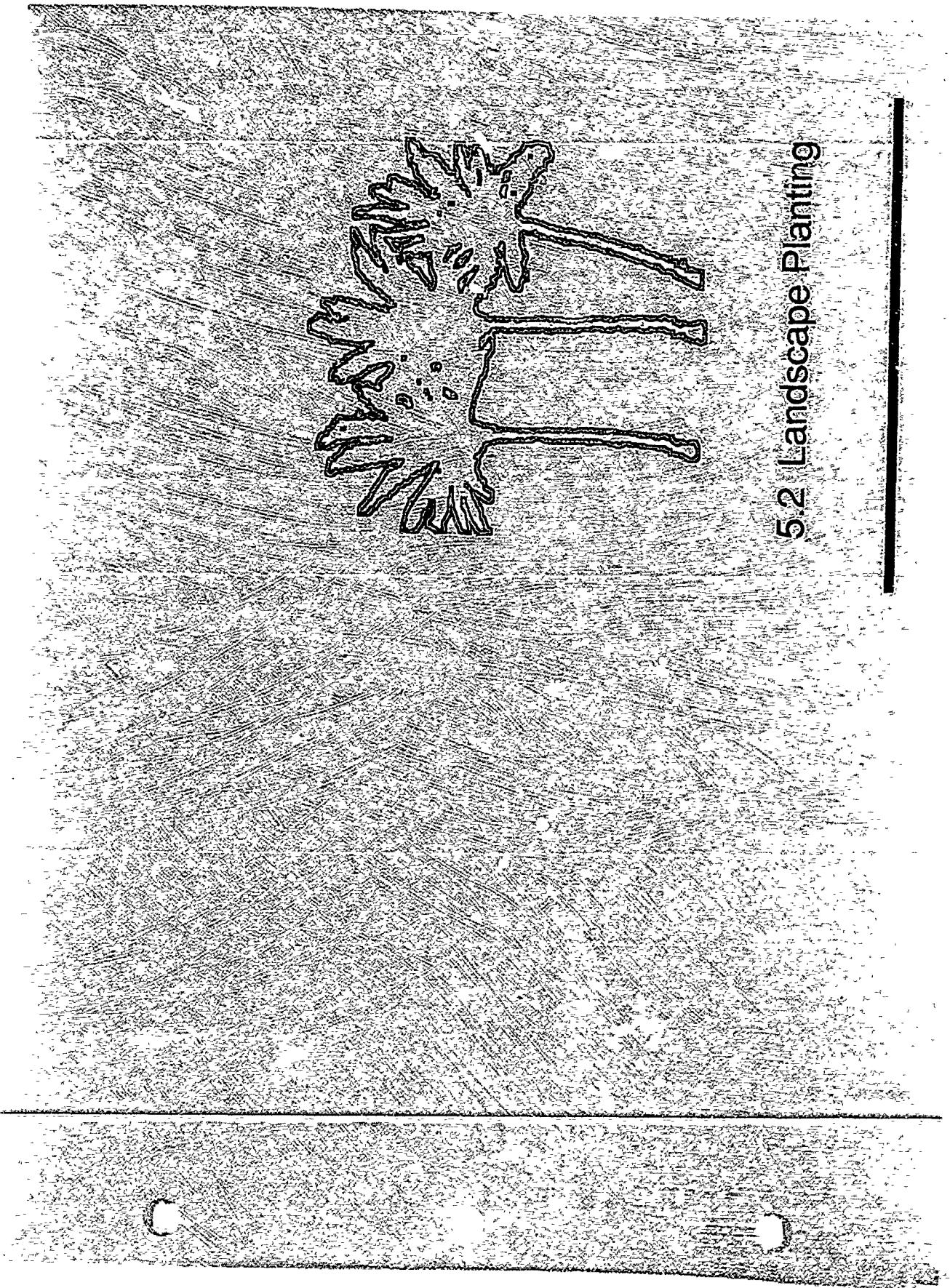


Changes in materials should reflect changes in elevation or plan view

5-5



## 5.2 Landscape Planting



## 5.2 Landscape Planting

### A. Introduction

Thoughtful selection and placement of plants serves to soften the appearance and improve the function of the built environment. The consistent and repetitive use of plants can help to unify and provide a sense of order to the NOSC Hawaii Lab's exterior. Plants should be chosen for their environmental and functional suitable as well as for their aesthetic value.

### B. Objectives

#### **Improve the appearance of the existing landscape**

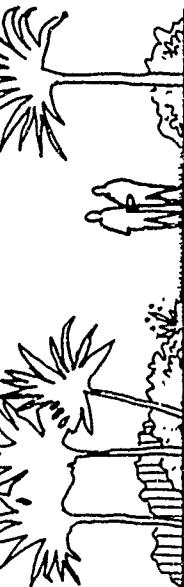
Take advantage of the positive attributes of the existing planting, such as the coconut palms, and repeat these elements. Prune or remove undesirable plant materials.

#### **Improve the appearance of new construction through the use of plants**

Select plants that provide interest from seasonal change and flower color. Make planting a high priority for new projects.

#### **Select plant materials that are horticulturally suitable.**

Choose plants that are suited to the coastal environment and easily maintained.



#### **Select plants for appropriate function**

Choose plants to screen objectionable views, to frame desirable views, to enclose space and to accent points of interest. Use plants for climate control and mitigation to reduce heat gain, reduce wind velocity and to reduce glare.

### C. Guidelines

#### Plant selection

Use preferred plant list provided to select appropriate plant material for each situation.

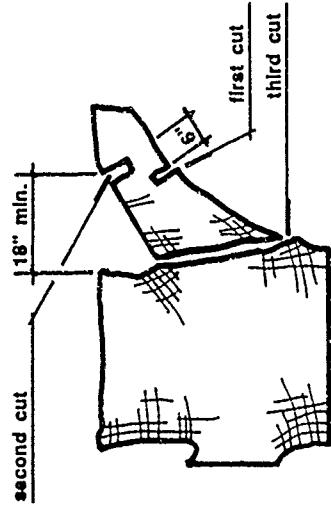
Generally, use low maintenance and pest or disease free plant whenever feasible or suitable.

Choose trees and shrubs that provide flower color for accent and interest.

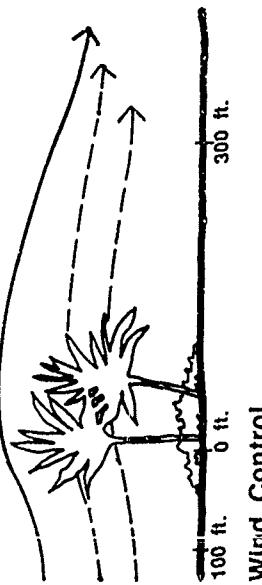
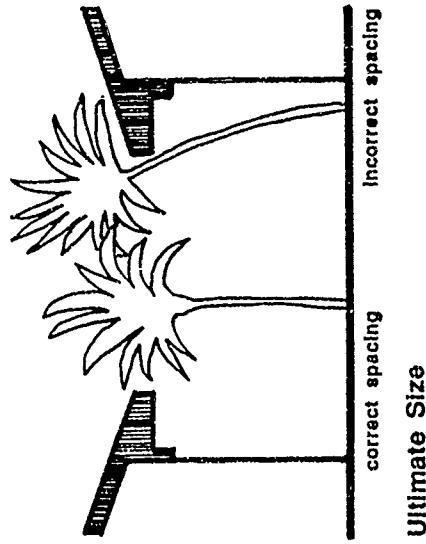
#### Plant installation

Plant shade trees for south sides of buildings and in parking lots to minimize heat gain.

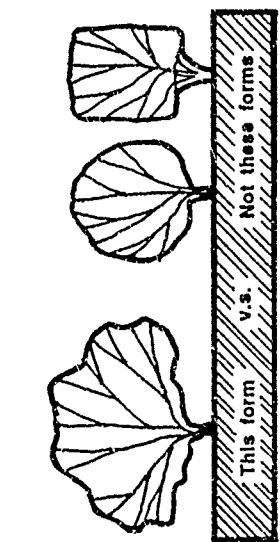
Plant trees and shrubs on the prevailing wind side of the site to reduce velocity.



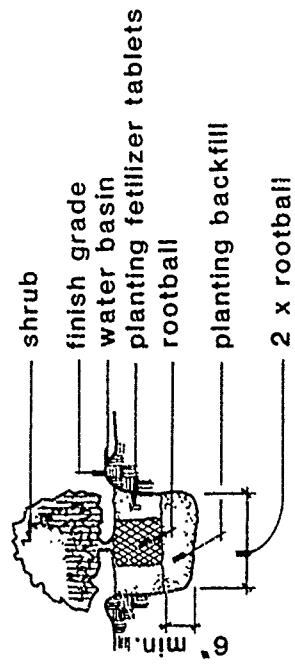
#### Pruning Technique



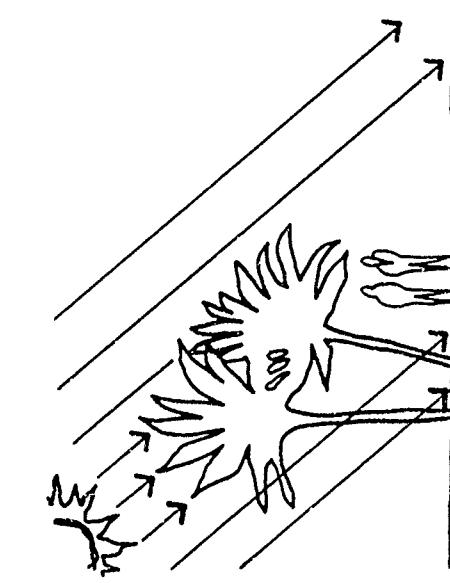
#### Wind Control



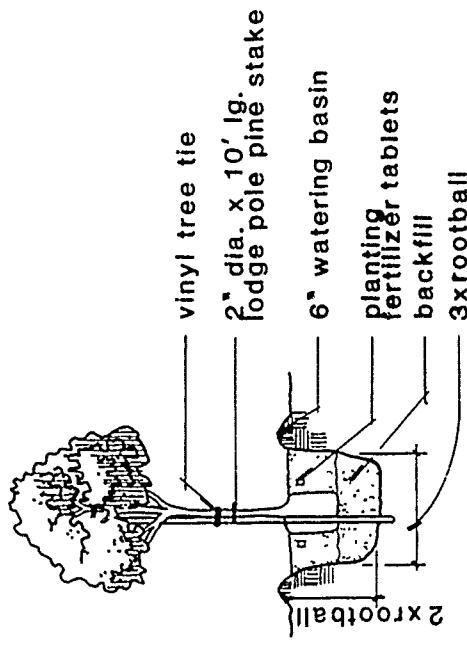
Maintain Natural Form



Shrub Planting



Sun Absorption/Glare Reduction



Tree Staking Detail

## D. Preferred Planting List

The success of planting design at the NOSC Hawaii Lab is dependent upon the careful selection of appropriate plant materials. All plants selected for new and replacement plantings shall be selected from this Preferred Planting List. Use the Plant Material Descriptions and the Plant Matrix to choose plants that fall into proper use, area and environmental condition categories.

### Trees

- Acacia confusa (Formosan Koa)
- Araucaria heterophylla (Norfolk Island Pine)
- Calophyllum inophyllum (True Kamani)
- Cassia glauca (Kalamona)
- Cassia javanica (Rainbow Shower)
- Casuarina equisetifolia (Ironwood)
- Citharexylum spinosum (Fiddlewood)
- Clusia rosea (Autograph Tree)
- Delonix regia (Poinciana)
- Erythrina crista-galli (Cockspur Coral Tree)
- Ficus lyrata (Fiddleleaf Fig)
- Melaleuca leucadendra (Cajeput Tree)
- Plumeria obtusa (Singapore Plumeria)
- Plumeria spp. (Plumeria)
- Samanea saman (Monkeypod Tree)
- Tabebuia pentaphylla (Pink Tecoma)
- Terminalia catappa (False Kamani)

### Palms

- Cocos nucifera (Coconut Palm)
- Roystonea regia (Royal Palm)

Shrubs

- Carissa grandiflora (Natal Plum)
- Codiaeum variegatum (Croton)
- Gardenia taitensis (Tiare Gardenia)
- Hibiscus rosa-sinensis (Hibiscus)
- Impatiens sultani (Impatiens)
- Ixora chinensis (Ixora)
- Ligustrum japonicum 'Texanum' (Texas Privet)
- Murraya paniculata (Mock Orange)
- Nerium oleander (Oleander)
- Pittosporum tobira (Tobira)
- Strelitzia reginae (Bird of Paradise)

Vines

- Argyreia nervosa (Silver Morning Glory)
- Bougainvillea spp. (Bougainvillea)
- Doxanthia unguis-cati (Cat's Claw)
- Hedera helix (Kuhi Vine)
- Thunbergia grandiflora (Moon Flower)

Groundcovers

- Dimorphotheca sinuata (Cape Marigold)
- Gazzania Hybrids (Clumping Gazzania)

## E. Plant Material Descriptions

### TREES

BOTANICAL NAME: <i>Acacia confusa</i>	COMMON NAME: Formosa Koa	NORMAL AND SPECIAL USE: Medium canopy tree used for screening or a sun control. Good for landscaping windy areas. Regarded as one of ten best shade trees in Hawaii.	SIZE: Height: 30'; Spread: 40'.	FORM: Low branching, spreading, filmy canopy, easily shaped, interesting structure.	RATE OF GROWTH: Fast.	FOLIAGE: Medium, fine texture. Medium to yellow-green, slightly curved leaves.	COLOR: Small yellow leaves, persistent brown seed pods	Maintenance: Low	WATER REQUIREMENTS: Drought tolerant when established.	PEST/DISEASE : No major pests or diseases.	RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.
BOTANICAL NAME: <i>Araucaria heterophylla</i>	COMMON NAME: Norfolk Island Pine	NORMAL AND SPECIAL USE: Tall vertical conifer used as buffer, windbreak and accent. Seasonally used as Christmas trees.	SIZE: Height: 100'; Spread: 25'.	FORM: Vertical conifer.	RATE OF GROWTH: Slow.	FOLIAGE: Dark green, needle-like leaves, compact, dense, fine texture.	COLOR: Dark green.	Maintenance: Low.	WATER REQUIREMENTS: Moderate.	PEST/DISEASE: No major pests or diseases.	RECOMMENDED INST. SIZE: 15 G.C., 8' tall.

BOTANICAL NAME: <i>Calophyllum inophyllum</i>	BOTANICAL NAME: <i>Cassia glauca</i>
COMMON NAME: True Kamani	COMMON NAME: Kalamona
NORMAL AND SPECIAL USE: Medium canopy tree generally used for shade and screen planting. Salt and wind tolerant.	NORMAL AND SPECIAL USE: Flowering small tree or large shrub. Used for accent or screening.
SIZE: Height: 30'; Spread: 30'.	SIZE: Height: 15'; Spread: 10'.
FORM: Dense, round headed canopy.	FORM: Low-branched, umbrella canopy.
RATE OF GROWTH: Very slow.	RATE OF GROWTH: Moderate.
FOLIAGE: Coarse texture. Leathery, oblong leaves.	FOLIAGE: Grey-green, compound leaves; medium fine texture.
COLOR: Glossy green leaves.	COLOR: Profuse yellow blossoms all year long.
MAINTENANCE: Medium. Although leaves are fairly persistent, 2" diameter fruit are troublesome to mowers.	MAINTENANCE: Medium. Flowers and seed pods present a moderate litter problem on paving.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Low.
PEST/DISEASE: No major pests or diseases.	PEST/DISEASE: No major pests or diseases.
RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.	RECOMMENDED INST. SIZE: 5 G.C., 4' tall, 3' spread.
ADDITIONAL REMARKS: Because this is a very slow growing tree, it should be used for long term rather than immediate effect. Indigenous.	ADDITIONAL REMARKS: Because it is a drought tolerant, colorful, shrub-like tree, the Kalamona is often used for highway shoulders and semi-wilderness planting.

BOTANICAL NAME: <i>Cassia javanica</i>	BOTANICAL NAME: <i>Casuarina equisetifolia</i>
COMMON NAME: Rainbow Shower	COMMON NAME: Ironwood
NORMAL AND SPECIAL USE: Spectacular medium-sized flowering tree, used for seasonal accent, color and shade. Common street tree.	NORMAL AND SPECIAL USE: Used for windbreak and beach front buffer planting. Commonly used as a tree but sometimes used as a trimmed hedge.
SIZE: Height: 30'; Spread: 40'.	SIZE: Height: 100'; Spread: 30'.
FORM: Broad, spreading, irregular canopy.	FORM: Vertical, drooping, open canopy.
RATE OF GROWTH: Moderately fast.	RATE OF GROWTH: Fast.
FOLIAGE: Semi-deciduous. Light green, medium fine texture.. Compound leaf.	FOLIAGE: Feathery, gray-green, needle-like leaves; fine texture.
COLOR: Cream to pink-orange. Profuse flowers from July to October.	COLOR: Gray-green.
MaintENANCE: Medium to high. Produces litter when blooming. For optimum appearance, it should be pruned every two years.	MaintENANCE: Medium to high. "Needles" fall continuously and small cones are plentiful and uncomfortable to bare feet.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Low to moderate.
PEST/DISEASE: No major pests or diseases.	PEST/DISEASE: Termites may infest old or dead limbs.
RECOMMENDED INST. SIZE: 15 G.C., 8' tall, 40' spread	RECOMMENDED INST. SIZE: 15 G.C., 7' tall, 3' spread.
ADDITIONAL REMARKS: This tree is considered to be one of Hawaii's ten best flowering trees. Should not be planted in windy areas as limbs break easily in strong winds.	ADDITIONAL REMARKS: This tree is sometimes used as a noise buffer, producing a whistling sound through its leaves. Few ground cover species can grow under Ironwoods which are left untrimmed and where needle clean up is not provided. Fallen "needles" provide the best cover. Ironwoods should only be used where there are already existing stands or where other trees would not be considered suitable.

BOTANICAL NAME: <i>Citharexylum spinosum</i>	BOTANICAL NAME: <i>Clusia Rosea</i>
COMMON NAME: Fiddlewood	COMMON NAME: Autograph Tree
NORMAL AND SPECIAL USE: Small to medium sized canopy tree used commonly for street tree or for urban pedestrian spaces.	NORMAL AND SPECIAL USE: Screen and shade planting. Especially good for areas which requires "clean" trees. Salt and wind tolerant.
SIZE: Height: 30'; Spread: 25'.	SIZE: Height: 30'; Spread: 30'.
FORM: Open, round canopy. Easily shaped or pruned.	FORM: Round, compact canopy. Easily shaped or pruned.
RATE OF GROWTH: Fast.	RATE OF GROWTH: Moderate.
FOLIAGE: Yellow green leaves. Medium texture.	FOLIAGE: Coarse textured, large, leathery leaves.
COLOR: Leaves turn bright orange in early spring.	COLOR: Semi-glossy, medium green leaves.
MAINTENANCE: Medium. Leaves drop frequently. Branches shatter in high winds. Flowers and fruit are insignificant.	MAINTENANCE: Low.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Low.
PEST/DISEASE: Susceptible to black twig borers.	PEST/DISEASE: No major pests or disease.
RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.	RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.
ADDITIONAL REMARKS: This is regarded as one of the ten best shade trees in Hawaii.	ADDITIONAL REMARKS: Because of its very persistent leaves and large sparse flowers, this tree is commonly used around swimming pools and playcourts where litter is a problem. One of the ten best shade trees in Hawaii.

BOTANICAL NAME: <i>Delonix regia</i>	BOTANICAL NAME: <i>Erythrina crista-galli</i>
COMMON NAME: Poinciana	COMMON NAME: Cockscomb Coral Tree
NORMAL AND SPECIAL USE: Medium sized, flowering tree used for accent, shade and as a street tree.	NORMAL AND SPECIAL USE: Small to medium sized flowering tree. Good for courtyards and small spaces. Interesting structure, accent tree.
SIZE: Height: 30'; Spread: 40'.	SIZE: Height: 25'; Spread: 25'.
FORM: Low spreading umbrella canopy.	FORM: Low branching, open canopy.
RATE OF GROWTH: Fast.	RATE OF GROWTH: Moderate.
FOLIAGE: Fine compound leaves. Fine filmy texture, deciduous	FOLIAGE: Medium green, medium texture. Good for dappled shade effect.
COLOR: Brilliant orange-red flowers cover tree between April and October.	COLOR: Red, pea-like flowers bloom throughout the year.
Maintenance: Medium. Roots are sometimes disruptive to the pavement.	Maintenance: Medium. Blossoms fall throughout the year.
WATER REQUIREMENTS: Low to moderate.	WATER REQUIREMENTS: Low to moderate. Drought tolerant once established
PEST/DISEASE: Older trees are occasionally infested by termites.	PEST/DISEASE: Older trees are occasionally infested by termites.
RECOMMENDED INST. SIZE: 25 G.C., 8' Tall., 5' spread.	RECOMMENDED INST. SIZE: 25 G.C. or field stock, 8' tall, 5' spread.
ADDITIONAL REMARKS: Considered one of the ten best flowering trees in Hawaii.	ADDITIONAL REMARKS: Considered one of the ten best flowering trees in Hawaii. Good in areas needing shallow rooted trees. Fairly salt tolerant.

BOTANICAL NAME: <i>Ficus lyrata</i>	BOTANICAL NAME: <i>Melaleuca leucadendra</i>
COMMON NAME: Fiddleleaf Fig	COMMON NAME: Cajeput Tree
NORMAL AND SPECIAL USE: Large canopy shade tree used in parking lots and for general landscape use.	NORMAL AND SPECIAL USE: Vertical tree used for windbreak, reforestation and as screen, buffer or accent in contained areas.
SIZE: Height: 35'; Spread: 35'.	SIZE: Height: 40'; Spread: 20'.
FORM: Dense, round headed. Low branching canopy. Easily pruned.	FORM: Upright columnar, canopy, usually slender trunk.
RATE OF GROWTH: Moderate.	RATE OF GROWTH: Moderately fast.
FOLIAGE: Large, leathery, fiddle shaped leaves. Coarse texture.	FOLIAGE: Gray-green leaves; medium-fine texture.
COLOR: Medium to yellow green foliage.	COLOR: Gray-green canopy, white flower spikes similar to "bottle brush".
MAINTENANCE: Low to medium. Large leaves are easily picked up, but fruits are a litter problem.	MAINTENANCE: Low.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Low to moderate. Fairly drought tolerant when established.
PEST/DISEASE: No major pests or diseases.	PEST/DISEASE: No major pests or diseases.
RECOMMENDED INST. SIZE: 25 G.C. or field stock, 8' tall, 5' spread.	RECOMMENDED INST. SIZE: 15 G.C. or 25 G.C., 8' tall, 3' spread.
ADDITIONAL REMARKS: Dense foliage acts as a good noise buffer.	ADDITIONAL REMARKS: Distinctive paper-like bark peels off in layers. Used for structure, texture and color interest. Can be planted in small scale areas.

BOTANICAL NAME: <i>Plumeria obtusa</i>	BOTANICAL NAME: <i>Plumeria spp.</i>
COMMON NAME: Singapore Plumeria	COMMON NAME: Plumeria
NORMAL AND SPECIAL USE: Ornamental shade and flowering tree. Used for contrast, accent, fragrance.	NORMAL AND SPECIAL USE: Ornamental flowering and shade trees.
SIZE: Height: 15'; Spread: 25'.	SIZE: Height: 15'; Spread: 25'.
FORM: Low branching, round headed canopy. Interesting structure. Easily pruned.	FORM: Low branching, round headed canopy. Interesting structure. Easily pruned.
RATE OF GROWTH: Moderate.	RATE OF GROWTH: Moderate.
FOLIAGE: Dark green, large glossy leaves. Coarse texture. Evergreen	FOLIAGE: Medium to dark green, large leaves Deciduous during winter months.
COLOR: Dark Green foliage. Large white flowers.	COLOR: Pink, yellow, red or white blossoms.
MAINTENANCE: Low to medium. Flowers drop throughout the year.	MAINTENANCE: Medium. Blossoms fall most of the year. Leaves fall during winter.
WATER REQUIREMENTS: Low to moderate.	WATER REQUIREMENTS: Low to moderate; drought tolerant when established.
PEST/DISEASE: Susceptible to scale and sooty mold. Occasional white fly infestation.	PEST/DISEASE: Susceptible to scale and sooty mold. Occasional white fly infestation.
RECOMMENDED INST. SIZE: 25 G.C. or field stock, 8' tall, 5' spread.	RECOMMENDED INST. SIZE: 25 G.C. or field stock, 8' tall, 5' spread.
ADDITIONAL REMARKS: This is one of the ten best flowering trees in Hawaii and the only one that blooms throughout the year. Can be easily propagated from cuttings.	ADDITIONAL REMARKS: One of the ten best flowering trees of Hawaii. Can be easily propagated from cuttings. Sap is poisonous in large doses.

BOTANICAL NAME: <i>Samanea saman</i>	BOTANICAL NAME: <i>Tabebuia pentaphylla</i>
COMMON NAME: <b>Monkeypod Tree</b>	COMMON NAME: <b>Pink Tecoma</b>
NORMAL AND SPECIAL USE: Large canopy shade tree used primarily for parking lots, streets and parks.	NORMAL AND SPECIAL USE: Small to medium sized flowering tree, used for accent, screening and street tree.
SIZE: Height: 40'; Spread: 80'.	SIZE: Height: 20'; Spread: 15'.
FORM: Horizontal umbrella canopy.	FORM: Upright, dense oval canopy.
RATE OF GROWTH: Fast.	RATE OF GROWTH: Moderately fast.
FOLIAGE: Medium green, medium-fine, dense texture. Semi-deciduous during winter.	FOLIAGE: Dark green leaves; medium texture.
COLOR: Medium green. Pink tufted flower.	COLOR: Abundant pink flowers from July through February.
Maintenance: Medium. Surface roots should be pruned if used in paved areas.	Maintenance: Medium. Flowers are a litter problem.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Moderate.
PEST/DISEASE: Mealy bugs are an occasional problem.	PEST/DISEASE: Mealy bugs are an occasional problem.
RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.	RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread.
ADDITIONAL REMARKS: One of ten best flowering trees in Hawaii.	ADDITIONAL REMARKS: One of ten best flowering trees in Hawaii.
ADDITIONAL REMARKS: This is the most common large canopy tree found on Navy bases in Hawaii. It is regarded as one of the ten best shade trees in Hawaii. Designer should specify root pruning when used near pavement.	ADDITIONAL REMARKS: This is the most common large canopy tree found on Navy bases in Hawaii. It is regarded as one of the ten best shade trees in Hawaii. Designer should specify root pruning when used near pavement.

## PALMS

BOTANICAL NAME: <i>Terminalia catappa</i>	BOTANICAL NAME: <i>Cocos nucifera</i>
COMMON NAME: False Kamani	COMMON NAME. Coconut Palm
NORMAL AND SPECIAL USE: Large canopy tree used for beachfront planting, shade and buffer. Wind and salt tolerant.	NORMAL AND SPECIAL USE: Tall, screening and tropical theme planting. Salt, wind and drought tolerant
SIZE: Height: 45'; Spread- 50'.	SIZE: Height: 70'; Spread: 30'.
FORM: Low branching, umbrella canopy.	FORM: Curving solitary trunk palm.
RATE OF GROWTH: Moderate.	RATE OF GROWTH: Slow
FOLIAGE: Large, blunt, leathery leaves turn red before they fall. Deciduous, coarse texture.	FOLIAGE: Plume-like leaves, 15' long.
COLOR: Leaves turn red before they fall.	COLOR: Yellow green leaves, gray-brown trunks.
MAINTENANCE: High. Leaves fall almost continually and fruits are a problem.	MAINTENANCE. High. 60-100 nuts/year, 8-12 fronds/year.
WATER REQUIREMENTS. Low to moderate.	WATER REQUIREMENTS: Low.
PEST/DISEASE: White flies are an occasional problem.	PEST/DISEASE: Coconut leaf roller
RECOMMENDED INST. SIZE: 25 G.C., 8' tall, 5' spread	RECOMMENDED INST. SIZE: Field Stock, 15' trunk minimum.
ADDITIONAL REMARKS: Should be used with care. Specify only as a beachfront tree or where established stands exist. Produces much litter.	ADDITIONAL REMARKS: Good for informal or random palm planting. Royal Palm is more appropriate for formal planting. Should be specified with care. Requires high maintenance. Use primarily where tall screening is necessary or where existing stands occur.

## SHRUBS

BOTANICAL NAME: *Roystonea regia*

COMMON NAME: Royal Palm

NORMAL AND SPECIAL USE: Formal planting of avenues, driveways, entrances, multi-story buildings.

SIZE: Height: 70'; Spread: 20'

FORM: Stately, tall, symmetrical palm; stout, solitary trunk.

RATE OF GROWTH: Slow

FOLIAGE: Dark green plume-like leaves.

COLOR: Dark green leaves; white trunk.

Maintenance: Low.

WATER REQUIREMENTS: Low.

PEST/DISEASE: No major pests or diseases.

RECOMMENDED INST. SIZE: Field stock 15' trunk, or to match existing trees.

ADDITIONAL REMARKS: Should be used with care since replacements are difficult to find.

BOTANICAL NAME: *Carissa grandiflora*

COMMON NAME: Natal Plum

NORMAL AND SPECIAL USE: Barrier hedge or pruned to small decorative tree. Salt, wind and shade tolerant.

SIZE: Height: 15'; Spread: 10'.

FORM: Dense, low branching, columnar shrub or round canopied tree.

RATE OF GROWTH: Moderate.

FOLIAGE: Dark green, shiny leaves; thorns

COLOR: White flowers, bright red fruit.

Maintenance: Low to medium. Requires trimming or pruning.

WATER REQUIREMENTS: Low to moderate. Requires trimming or pruning.

PEST/DISEASE: Scale and thrips.

RECOMMENDED INST. SIZE: 5 G.C., 6' tall, 3' spread.

ADDITIONAL REMARKS: Good beachfront barrier. Thorns.

BOTANICAL NAME: <i>Codiaeum variegatum</i>	BOTANICAL NAME: <i>Gardenia taitensis</i>	
COMMON NAME: Croton	COMMON NAME: Tiare Gardenia	
NORMAL AND SPECIAL USE: Colorful hedge or pruned small tree. Fairly salt and wind tolerant.	NORMAL AND SPECIAL USE: Flowering shrub or small tree used for accent or screening. Salt and wind tolerant. Very fragrant.	
SIZE: Height: 12'; Spread: 6'.	SIZE: Height: 8'; Spread: 6'.	
FORM: Low branching shrub.	FORM: Erect, low-branching woody shrub.	
RATE OF GROWTH: Slow.	RATE OF GROWTH: Moderate.	
FOLIAGE: Glossy, leathery leaves vary in size and color.	FOLIAGE: Dark green, glossy leaves, 8" long	
COLOR: Multi-colored; green, red, yellow, black	COLOR: White flowers, all year.	
M AINTENANCE: Low to medium	M AINTENANCE: Low to medium. Prune occasionally to shape or induce new growth.	
WATER REQUIREMENTS: Low to moderate. Drought tolerant when established.	WATER REQUIREMENTS: Low to moderate.	
PEST/DISEASE: Scale, thrips, mealy bugs, and spider mites.	PEST/DISEASE: Occasional scale, sooty mold, thrips, mealy bugs, oleander hawk moth caterpillar.	
RECOMMENDED INST. SIZE: 5 G.C., 3' tall, 2' spread.	RECOMMENDED INST. SIZE: 5 G.C., 2' tall, 3' spread.	
ADDITIONAL REMARKS: Should be used with restraint or in masses for special effect.	ADDITIONAL REMARKS: Very fragrant and attractive shrub. Suitable to many situations and conditions.	

BOTANICAL NAME: <i>Hibiscus rosa-sinensis</i>	BOTANICAL NAME: <i>Impatiens sultani</i>
COMMON NAME: Hibiscus	COMMON NAME: Impatiens
NORMAL AND SPECIAL USE: Flowering hedge for screening, buffer.	NORMAL AND SPECIAL USE: Flowering accent or mass planting in contrasting ground cover. Needs semi-protected, partial shade areas.
SIZE: Height: 15'; Spread: 8'.	SIZE: Height: 18'.
FORM: Erect, low branching, woody shrub.	FORM: Upright perennial.
RATE OF GROWTH: Moderate.	RATE OF GROWTH: Fast.
FOLIAGE: Dark green leaves.	FOLIAGE: Medium green leaves on succulent stem.
COLOR: Red flowers, all year.	COLOR: Wide range of flower colors from white, pink, purple to red; blooms all year.
Maintenance: Low.	Maintenance: Low to medium; needs cutting back occasionally to prevent legginess.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Moderate to high.
PEST/DISEASE: Scale and sooty mold.	PEST/DISEASE: Susceptible to root rot in poor drainage, easily burned by fertilizer.
RECOMMENDED INST. SIZE: 1 G.C. or 2 1/2 G.C., 3' tall, 2' spread.	RECOMMENDED INST. SIZE: 1 G.C. at 1' o.c.
ADDITIONAL REMARKS: State flower of Hawaii. This is one of the most common, popular and attractive hedge plants in Hawaii.	ADDITIONAL REMARKS: Propagates itself readily by abundant seeds.

**BOTANICAL NAME:** Ixora chinensis  
**COMMON NAME:** Ixora  
**NORMAL AND SPECIAL USE:** Small flowering shrub for color accent.

**SIZE:** Height: 4'; Spread: 3'.  
**FORM:** Erect, woody, evergreen shrub. Dense crown of multiple stems.

**RATE OF GROWTH:** Moderate.

**FOL AGE:** Glossy, dark green, oval leaves 3' to 4' long.

**COLOR:** White, pink, yellow, orange or red flowers all year.

**MAINTENANCE:** Low. May be pruned. Deficiency in minor fertilizer elements makes leaves yellow.

**WATER REQUIREMENTS:** Moderate.

**PEST/DISEASE:** Scale, sooty mold, thrips and mealy bugs.

**RECOMMENDED INST. SIZE:** 1 G.C., 2' high, 2' spread.

**BOTANICAL NAME:** Ligustrum japonicum 'Texanum'  
**COMMON NAME:** Texas Privet

**NORMAL AND SPECIAL USE:** Large shrub for hedge, screening, buffer. Fairly wind and salt tolerant.

**SIZE:** Height: 12'; Spread: 6'.  
**FORM:** Erect, woody, evergreen shrub.

**RATE OF GROWTH:** Moderate to fast.

**FOLIAGE:** Glossy, dark green, oval leaves.

**COLOR:** White flowers.

**MAINTENANCE:** Low. May require periodic trimming.

**WATER REQUIREMENTS:** Moderate.

**PEST/DISEASE:** No major pests or diseases

**RECOMMENDED INST. SIZE:** 5 G.C., 3', 2' spread.

**ADDITIONAL REMARKS:** This is one of the most common, popular and attractive hedge plants in Hawaii.

BOTANICAL NAME:	<i>Murraya paniculata</i>	BOTANICAL NAME:	<i>Nerium oleander</i>
COMMON NAME:	Mock Orange	COMMON NAME:	Oleander
NORMAL AND SPECIAL USE:	Tall, evergreen shrub used as hedge, screening, buffer. Can be pruned to small tree. Somewhat salt and wind tolerant.	NORMAL AND SPECIAL USE:	Flowering shrub used as hedge, screening, buffer. Fairly salt and wind tolerant.
SIZE:	Height: 12'; Spread: 5'.	SIZE:	Height: 12'; Spread: 6'.
FORM:	Upright, woody, evergreen shrub; dense foliage.	FORM:	Woody evergreen shrub, dense foliage.
RATE OF GROWTH:	Moderate.	RATE OF GROWTH:	Fast.
FOLIAGE:	Small, oval, dark green, glossy leaves.	FOLIAGE:	Long, narrow, dark green leaves.
COLOR:	Fragrant white flowers.	COLOR:	White, pink, salmon, red.
Maintenance:	Low to moderate. Needs occasional pruning.	Maintenance:	Low.
WATER REQUIREMENTS:	Low to moderate. Needs occasional pruning.	WATER REQUIREMENTS:	Low. Very drought tolerant when established.
PEST/DISEASE:	No major pests or diseases.	PEST/DISEASE:	Oleander hawk moth, mealy bugs, scale.
RECOMMENDED INST. SIZE:	1' G.C., 3' 2' spread.	RECOMMENDED INST. SIZE:	Minimum 1 G.C., 2 1/2', 1 1/2' spread.
ADDITIONAL REMARKS:	One of the most common, popular and attractive hedge plants in Hawaii. All parts are poisonous.	ADDITIONAL REMARKS:	One of the most common, popular and attractive hedge plants in Hawaii. All parts are poisonous.

BOTANICAL NAME: <i>Pithecellobium toebira</i>	BOTANICAL NAME: <i>Sterlitzia reginae</i>
COMMON NAME: <b>Tobira</b>	COMMON NAME: <b>Bird of Paradise</b>
NORMAL AND SPECIAL USE: Evergreen, woody shrub used commonly for hedge, screening, buffer. Salt and wind tolerant.	NORMAL AND SPECIAL USE: Flowering mass or specimen tropical planting. Color and texture accent. Salt, wind and drought tolerant.
SIZE: Height: 6'; Spread: 4'.	SIZE: Height: 4'; Spread: 4'.
FORM: Woody, compact, dense shrub.	FORM: Stemless, shrubby, clumping plant, lily-like form.
RATE OF GROWTH: Slow to moderate.	RATE OF GROWTH: Moderate.
FOLIAGE: Leathery, oblong leaves, about 3' long.	FOLIAGE: Stiff, leathery, blue-green, banana-like leaves, 3' to 4' long.
COLOR: Dark green.	COLOR: Blue green leaves, striking orange and blue flower.
Maintenance: Low. Occasional pruning.	Maintenance: Low to medium; dead leaves and flower clusters should be removed.
WATER REQUIREMENTS: Moderate.	WATER REQUIREMENTS: Low to moderate.
PEST/DISEASE: Scale, spider mites, mealy bugs.	PEST/DISEASE: Oleander scale.
RECOMMENDED INST. SIZE: 2 1/2 to 5 G.C., 20' tall, 3' spread.	RECOMMENDED INST. SIZE: Field stock rooted division 2' tall
	ADDITIONAL REMARKS: Good color accent for beachfront planting.

## VINES

BOTANICAL NAME: *Argyreia nervosa*

COMMON NAME: **Silver Morning Glory**

NORMAL AND SPECIAL USE: Vines to cover fences, trellises.

SIZE: Height: 50'.

FORM: Climbing woody vine.

RATE OF GROWTH: Fast.

FOLIAGE: Large downy heart shaped leaves.

COLOR: Silvery gray-green, lavender flowers, spring through fall.

MAINTENANCE: Low.

WATER REQUIREMENTS: Moderate.

PEST/DISEASE: Scale, mealy bugs, Chinese rose beetle.

RECOMMENDED INST. SIZE: 1 G.C., 3' runners.

BOTANICAL NAME: *Bougainvillea* spp.

COMMON NAME: **Bougainvillea**

NORMAL AND SPECIAL USE: Profusely flowering, large scale shrubby vine, good on trellises or as ground cover, barrier or accent plant. Salt and wind tolerant.

SIZE: Height: 10'; Spread: 10'.

FORM: Shrubby, woody, spreading vine.

RATE OF GROWTH: Moderate.

FOLIAGE: Dull green leaf with colorful bract.

COLOR: White, pink, orange, red and purple.

MAINTENANCE: Low to moderate. Needs occasional pruning to control. Flowers produce litter.

WATER REQUIREMENTS: Low. Very drought tolerant when established.

PEST/DISEASE: No major pests or diseases.

RECOMMENDED INST. SIZE: 1 to 5 G.C., 3' runners.

ADDITIONAL REMARKS: Good for showy color wherever there is adequate sun. Most varieties have thorns. "Miss Manila" (pink-orange) is thornless.

BOTANICAL NAME: *Doxantha unguis-cati*  
COMMON NAME: Cat's Claw  
NORMAL AND SPECIAL USE: Flowering vine on trellises, fences.  
SIZE: Height: 40'.  
FORM: Slender, woody, climbing vine.  
RATE OF GROWTH: Fast.  
FOLIAGE: Thin, oval, wavy-edged leaves.  
COLOR: Light green leaves, yellow tubular flowers, spring through summer.  
MAINTENANCE: Low. Flowers can be a litter problem.  
WATER REQUIREMENTS: Moderate.  
PEST/DISEASE: No major pests or diseases.  
RECOMMENDED INST. SIZE: 1 G.C., 2' runners.  
ADDITIONAL REMARKS: Very showy when in bloom. Good climber.

BOTANICAL NAME: *Ipomoea horsfalliae*  
COMMON NAME: Kuhlo Vine  
NORMAL AND SPECIAL USE: Flowering vine on fences and trellises.  
SIZE: Height: 30'.  
FORM: Twining, climbing, perennial vine.  
RATE OF GROWTH: Fast.  
FOLIAGE: Palmate, dark green leaves.  
COLOR: Profuse crimson to fuchsia flowers.  
MAINTENANCE: Medium. Flowers can be littersome.  
WATER REQUIREMENTS: Moderate.  
PEST/DISEASE: No major pests or diseases.  
RECOMMENDED INST. SIZE: 1 G.C., 2' runners.  
ADDITIONAL REMARKS: Very showy when in bloom. Requires little or no care.

## GROUNDCOVERS

BOTANICAL NAME: *Thunbergia grandiflora*

COMMON NAME: **Moon Flower**

NORMAL AND SPECIAL USE: Flowering vine in fences, walls and trellises.

SIZE: Height: 30'.

FORM: High, spreading, climbing vine.

RATE OF GROWTH: Fast.

FOLIAGE: Rough, broad, heart shaped leaves.

COLOR: Large white flowers.

MAINTENANCE: Low to medium. Should be cut back periodically. Flowers may be littersome.

WATER REQUIREMENTS: Moderate.

PEST/DISEASE: No major pests or diseases.

RECOMMENDED INST. SIZE: 1 G.C., 2' runners.

ADDITIONAL REMARKS: One of the fastest growing vines.

BOTANICAL NAMES: *Dimorphotheca sinuata*

COMMON NAME: **Cape Marigold**

NORMAL AND SPECIAL USE: Low ground cover in sandy, shallow or poor soil. Fairly salt and drought tolerant.

SIZE: Height: 6".

FORM: Spreading perennial.

RATE OF GROWTH: Moderate.

FOLIAGE: Gray-green, toothed leaves, 3' long.

COLOR: Yellow, daisy-like flower.

MAINTENANCE: Low to medium.

WATER REQUIREMENTS: Low.

PEST/DISEASE: No major pests or diseases.

RECOMMENDED INST. SIZE: 4" pot 12" o.c.

BOTANICAL NAME: <b>Gazania Hybrids</b>	BOTANICAL NAME: <b>Ophiopogon japonicus</b>
COMMON NAME: <b>Clumping Gazania</b>	COMMON NAME: <b>Mondo Grass</b>
NORMAL AND SPECIAL USE: Low ground cover used for color and texture contrast. Good for erosion control. Fairly salt and drought tolerant.	NORMAL AND SPECIAL USE: Ground cover used as a substitute for grass or as an edge treatment for lawns. Fairly salt tolerant, very shade tolerant.
SIZE: Height: 8"	SIZE: Height: 6".
FORM: Low creeping perennial.	FORM: Turf forming grass-leaved lily.
RATE OF GROWTH: Moderately fast.	RATE OF GROWTH: Moderately slow.
FOLIAGE: Silvery gray-green leaves	FOLIAGE: Narrow, blade-like clusters of leaves, 6" - 9" long, rising from an underground stem.
COLOR: Silver green leaves; yellow, daisy-like flowers, all year.	COLOR: Dark blue-green leaves.
MAINTENANCE: Low to medium	MAINTENANCE: Medium to low when established.
WATER REQUIREMENTS: Low to moderate.	WATER REQUIREMENTS: Moderate.
PEST/DISEASE: Slugs and snails.	PEST/DISEASE: No major pests or diseases.
RECOMMENDED INST. SIZE: 4" pot or field division, 8" o.c.	RECOMMENDED INST. SIZE: Rooted sprigs 4" o.c.
ADDITIONAL REMARKS: Very attractive, neat ground cover for high visibility areas.	ADDITIONAL REMARKS: Very attractive, neat ground cover for high visibility areas.

**BOTANICAL NAME:** Portulaca grandiflora  
**COMMON NAME:** Portulaca

**NORMAL AND SPECIAL USE:** Ground cover in small planting areas  
Drought and salt tolerant. Plant only in full sun.

**SIZE:** Height: 6".

**FORM:** Spreading succulent plant.

**RATE OF GROWTH:** Fast.

**FOLIAGE:** Dull green succulent leaves, 1" long.

**COLOR:** Dull green leaves, bright cerise flowers.

**MAINTENANCE:** Low.

**WATER REQUIREMENTS:** Low to moderate. Drought tolerant when established.

**PEST/DISEASE:** No major pests or diseases.

**RECOMMENDED INST. SIZE:** 4" pot 12" o.c.

**BOTANICAL NAME:** Sedum confusum  
**COMMON NAME:** Stonecrop

**NORMAL AND SPECIAL USE:** Tight ground cover in sandy beachfront planting. Full sun or partial shade. Salt tolerant.

**SIZE:** Height: 8".

**FORM:** Dense, low clumping succulent. Fine texture.

**RATE OF GROWTH:** Moderately fast.

**FOLIAGE:** Small (1/2" long), thick, pale, yellow-green leaves.

**COLOR:** Clusters of small yellow flowers, May through August.

**MAINTENANCE:** Medium.

**WATER REQUIREMENTS:** Low.

**PEST/DISEASES:** No major pests or diseases.

**RECOMMENDED INST. SIZE:** Rooted cuttings 6" o.c.

BOTANICAL NAME:	Trachelospermum jasminoides	BOTANICAL NAME:	<i>Wedelia trilobata</i>
COMMON NAME:	Star Jasmine	COMMON NAME:	<i>Wedelia</i>
NORMAL AND SPECIAL USE:	Fragrant, flowering, ground cover or vine. Salt and wind tolerant.	NORMAL AND SPECIAL USE:	Flowering ground cover for general landscape use and for erosion control on slopes and hillsides.
SIZE:	Height: 8".	SIZE:	Height: 2'.
FORM	Twinning, woody evergreen vine.	FORM:	Creeping, mounding, herbaceous perennial.
RATE OF GROWTH:	Moderate.	RATE OF GROWTH:	Fast.
FOLIAGE:	Dark green, leathery, oval leaves, 2".	FOLIAGE:	2" long, toothed, hairy leaves.
COLOR:	Dark green leaves. Fragrant white flowers.	COLOR:	Bright green, yellow daisy-like flowers, all year.
MAINTENANCE:	Low. Cut back after blooming period to induce growth.	MAINTENANCE:	Low to medium. Should be cut back several times a year to control height and encourage new growth. Do not mow below 2" in height.
WATER REQUIREMENTS:	Moderate.	WATER REQUIREMENTS:	Moderate.
PEST/DISEASE:	No major pests or diseases.	PEST/DISEASE:	Mites, leafhopper, leaf spot disease.
RECOMMENDED INST. SIZE:	4" pot at 18" o.c.	RECOMMENDED INST. SIZE:	Rooted cuttings, 1' o.c.
ADDITIONAL REMARKS:	One of the most common inexpensive and dependable ground covers in Hawaii. Good for uneven topography. Can be mowed.		

**F. Plant Selection Matrix**

<b>PLANT LIST</b>		USE	APPLICATION	SIZE	FORM										
Botanical Name (Common Name)															
<b>TREES</b>															
1. <i>Acacia confusa</i> (Formosan Koa)															
2. <i>Araucaria heterophylla</i> (Norfolk Island Pine)															
3. <i>Calophyllum inophyllum</i> (True Kamani)															
4. <i>Cassia glauca</i> (Kalamona)															
5. <i>Cassia javanica</i> (Rainbow Shower)															
6. <i>Casuarina equisetifolia</i> (Ironwood)															
7. <i>Citharexylum spinosum</i> (Fiddlewood)															
8. <i>Clusia rosea</i> (Autograph Tree)															
9. <i>Delonix regia</i> (Poinciana)															
10. <i>Erythrina cristata-galli</i> (Cockscomb Coral Tree)															
11. <i>Ficus lyrata</i> (Fiddleleaf Fig)															
12. <i>Melaleuca leucadendra</i> (Cajeput Tree)															
13. <i>Plumeria obtusa</i> (Singapore Plumeria)															
14. <i>Plumeria</i> spp. (Plumeria)															
15. <i>Samanera saman</i> (Monkeypod Tree)															
16. <i>Tabebuia pentaphylla</i> (Pink Tecoma)															
17. <i>Terminalia catappa</i> (False Kamani)															
<b>PALMS</b>															
18. <i>Cocos nucifera</i> (Coconut Palm)															
19. <i>Roystonea regia</i> (Royal Palm)															

RATE OF GROWTH	PEST/DISEASE	MAINTENANCE	WATER REQUIREMENTS	COLOR	
				Low	High
1.				yellow/green dk. green	
2.				glossy green	
3.				yellow bloom	
4.				bloom varies	
5.				gray green	
6.				orange leaves in spring	
7.				medium green	
8.				orange-red bloom	
9.				red bloom	
10.				med. yellow/green	
11.				gray green	
12.				dk. green	
13.				bloom - pink, yellow	
14.				med. green	
15.				pink bloom	
16.				red leaves before fall	
17.				yellow/green dk. green	
18.					
19.					

## PLANT LIST

Botanical Name  
(Common Name)

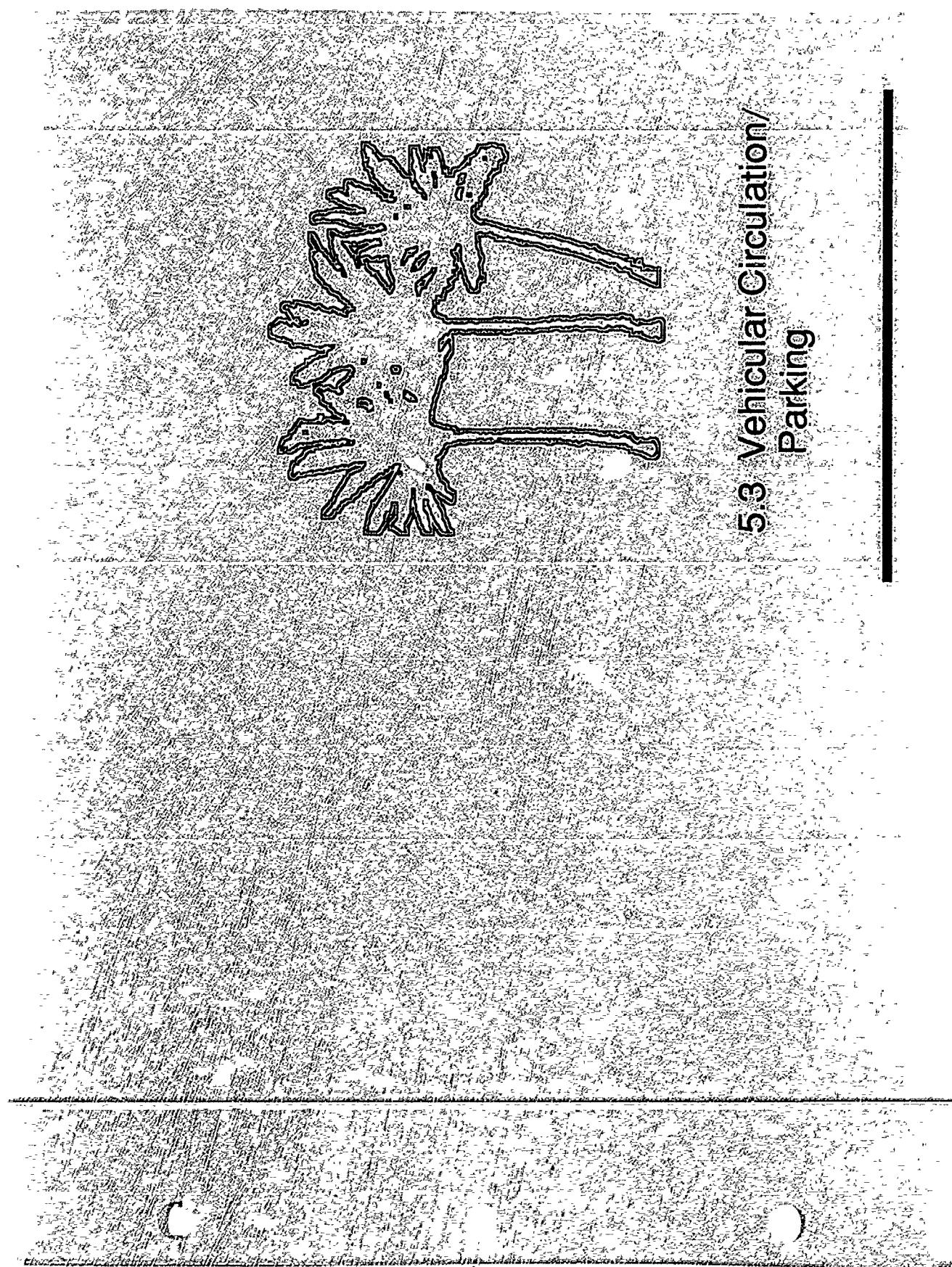
Botanical Name (Common Name)	USE	APPLICATION	SIZE	FORM	
				5'	10'
<b>SHRUBS</b>					
20. <i>Carissa grandiflora</i> (Natal Plum)					
21. <i>Codiaeum variegatum</i> (Croton)					
22. <i>Gardenia taitensis</i> (Tiare Gardenia)					
23. <i>Hibiscus rosa-sinensis</i> (Hibiscus)					
24. <i>Impatiens sultani</i> (Impatiens)					
25. <i>Ixora chinensis</i> (Ixora)					
26. <i>Ligustrum jasponicum 'Texanum'</i> (Texas Privet)					
27. <i>Murraya paniculata</i> (Mock Orange)					
28. <i>Nerium oleander</i> (Oleander)					
29. <i>Pittosporum tobira</i> (Tobira)					
30. <i>Strelitzia reginae</i> (Bird of Paradise)					
<b>VINES</b>					
31. <i>Argyreia nervosa</i> (Silver Morning Glory)					
32. <i>Bougainvillea</i> spp. (Bougainvillea)					
33. <i>Liocanthes unguis-cati</i> (Cat's Claw)					
34. <i>Ipomoea horsfalliae</i> (Kuhio Vine)					
35. <i>Thunbergia grandiflora</i> (Moon Flower)					

RATE OF GROWTH	PEST/DISEASE	MAINTENANCE	WATER REQUIREMENTS	COLOR																
					20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.
Slow	Moderate	None	High	white bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Slow	Moderate	Some	High	multi-colored	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Slow	Moderate	None	Low	white bloom	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	●
Slow	Moderate	Some	Low	red bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	High	bloom varies	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Fast	Moderate	Some	High	white bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	Low	white bloom	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	●
Fast	Moderate	Some	Low	white bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	High	pink bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	Some	High	white bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	Low	dk green	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	Some	Low	orange/bk bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	High	lavender bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	Some	High	bloom varies	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	Low	yellow bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	Some	High	crimson/Rosalia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fast	Moderate	None	Low	white bloom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●



RATE OF GROWTH	PEST/DISEASE	MAINTENANCE	WATER REQUIREMENTS	COLOR	
				High	Low
36.				yellow bloom	
37.				yellow bloom	
38.				dk. blue-green	
39.				cerise bloom	
40.				yellow bloom	
41.				white bloom	
42.				yellow bloom	
43.				bright green	
44.				blue green	

### 5.3 Vehicular Circulation/ Parking



## 5.3 Vehicular Circulation / Parking

### A. Introduction

The vehicular circulation system provides not only a primary means of access but also a vantage point from which the NOSC Hawaii Lab is seen and understood. Most NOSC employees and visitors arrive by automobiles that require parking.

### B. Objectives

- Upgrade existing roadways**  
Repair road surface to provide adequate drainage.
- Provide better identification signage to make circulation more efficient.**
- Soften roadway edges with planting.**
- Improve parking efficiency**  
Discourage random parking between or directly adjacent to buildings and provide better organized and centralized parking.



Main Parking Lot



Parking Between Buildings

### C. Guidelines

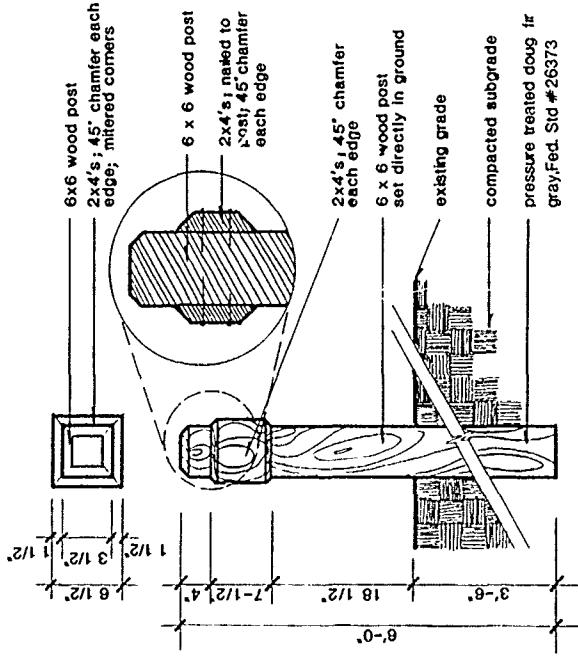
**Roadways**  
Along main entry road, undulate fence and provide additional planting.

**Parking**  
Concentrate parking in designated areas. (Refer to Comprehensive Development Plan in pocket at the back of this document for locations and numbers of parking spaces proposed.)

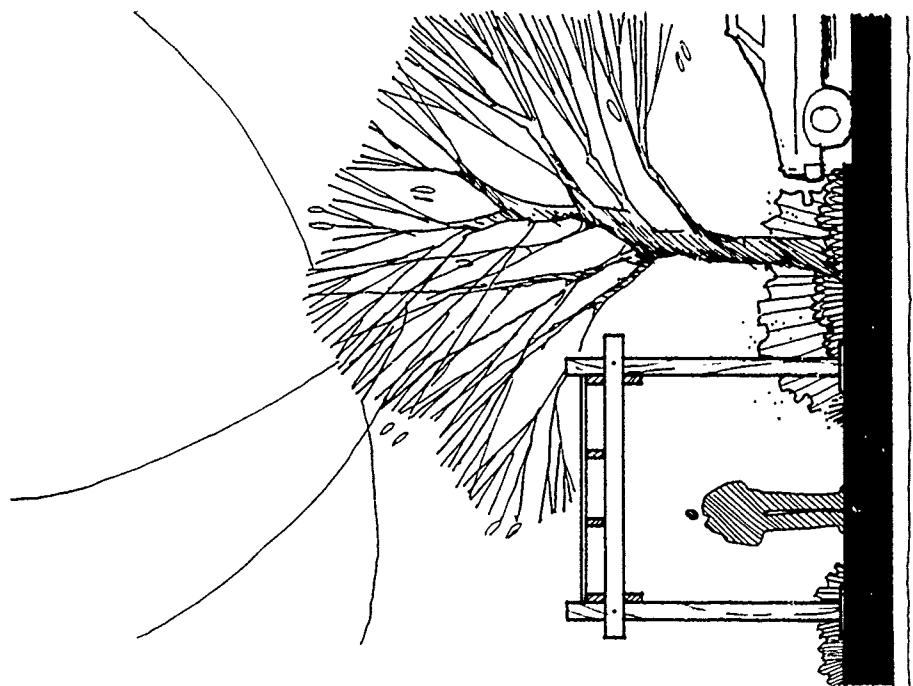
Provide control elements (ie: bollards) to prevent vehicles from parking between buildings.

Use appropriate ratio of compact size spaces vs. standard size parking spaces (ie: 50%)

Plant shade trees in parking areas to reduce glare and to minimize heat gain.

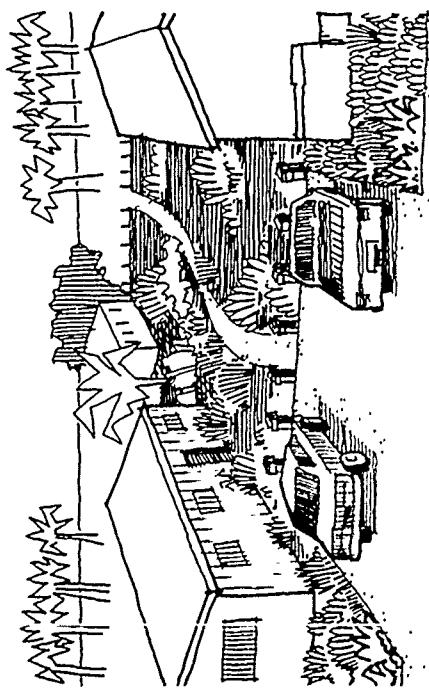


Bollard Detail



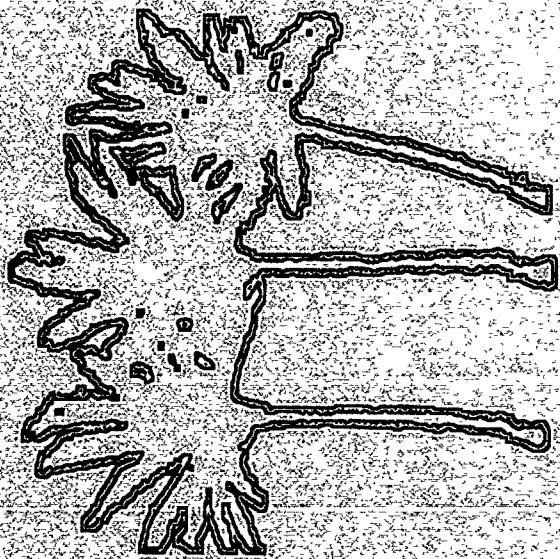
Buffer between parking and walkways

5-41



Bollards prevent parking between buildings

## 5.4 Pedestrian Circulation



## 5.4 Pedestrian Circulation

### A. Introduction

Once employees and visitors have arrived at the Lab, virtually all additional circulation is pedestrian in nature. A successful pedestrian circulation system must be a continuing system of connected walkways which present a clear articulated path of travel between destinations. It will be used if it is pleasant, comfortable and convenient.

### B. Objectives

<b>Retain existing informal scale or "feel"</b>	<b>Avoid abrupt changes in grade.</b>
<b>Provide safety and comfort by separation from vehicles.</b>	<b>Provide pedestrian amenities such as site furnishings.</b>
<b>Utilize design consistency and interest</b>	<b>Develop a hierarchy and order for walkways.</b>
<b>Provide a convenient and continuous pedestrian circulation network.</b>	<b>Provide covered walkway system.</b>
	<b>Shelter pedestrians from extreme environmental conditions.</b>



Conflict between pedestrians and vehicles

### C. Guidelines

#### Design

Walkways for major circulation shall be 4'-5' wide and 3' wide for secondary circulation.

Overhead structures shall be 8'-10' wide (see covered walkway plan for location).

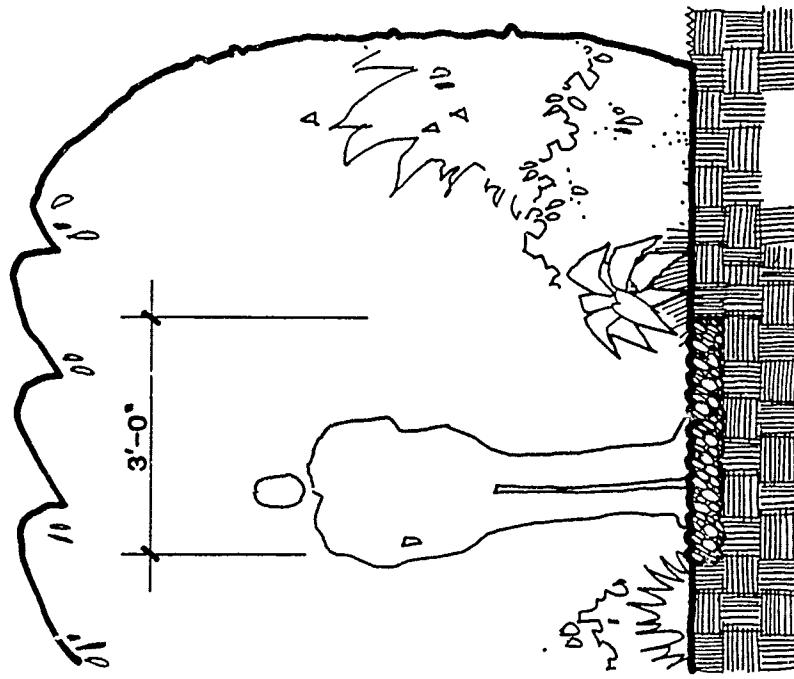
For new walks, avoid abrupt grade changes so that curbs and steps will not be necessary.

#### Materials

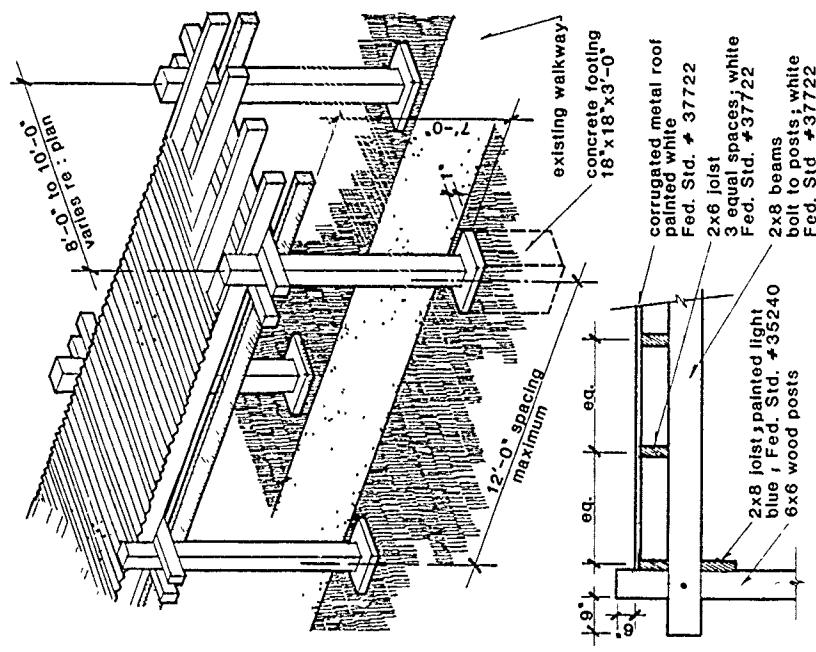
Provide informal crushed coral pathways through perimeter open space areas if pedestrian circulation is required.

Materials for primary walkways shall be asphalt concrete or exposed aggregate (coral) concrete.

Overhead structures shall be constructed of wood supports with corrugated metal roofing material. The structure shall be painted white with light blue trim (see detail) to compliment existing architecture.

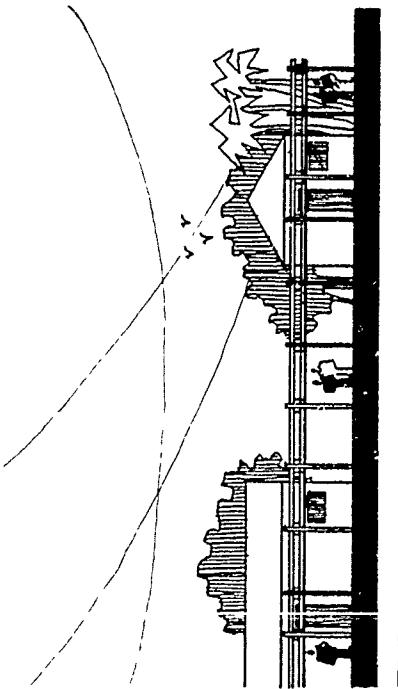


**Crushed Coral Walkway**



Overhead Structure Detail

5-45



Overhead Structure

## 5.5 Signage

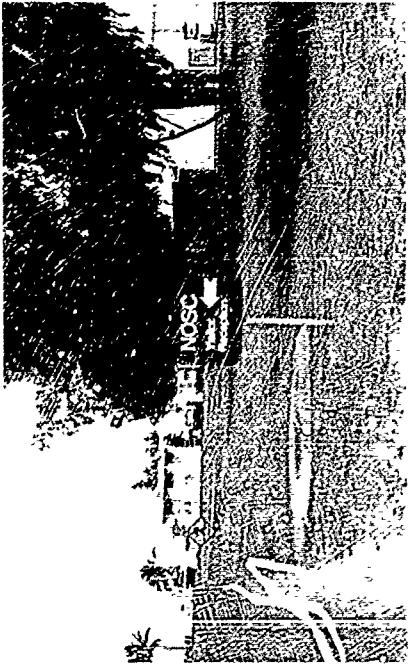
## 5.5 Signage

### A. Introduction

A sign's fundamental purpose is to communicate information. Consideration must be given not only to what a sign says but also how it says it, the visual appearance and organization, its location and its relation to other signs at the Lab. Establishing and implementing a coordinated signage system is a relatively simple, inexpensive, but effective means of improving the visual appearance and functioning of the NOSC Hawaii Lab.

### B. Objectives

- Provide a signage system that is clear, coordinated, consistent and flexible.  
Standardize typography.
- Carefully consider location of each sign.  
Locate directional signs along roadway to provide warning in advance of decision points.
- Locate signs where they are visible and in a manner compatible with their surroundings
- Minimize number of signs.  
Install signs only where they are necessary. Remove signs where they are redundant and concentrate sign locations when possible.
- Continue to employ existing sign standards.  
Conform to building identification signage standards of MCAS Kaneohe Bay.



Existing approved sign design

### C. Guidelines

**Free-standing Signs.**  
Use "Helvetica Regular" upper and lower case typeface for all free-standing signs.

Letters shall be White Fed. Std. #27722, background shall be Dark Blue Fed. Std #25050 for all free-standing signs. (See color schedule section 4.3).

Spacing for words and letters shall be normal spacing in accordance with standard typography guidelines. Do not spread word spacing to fill a line.

Generally position words to the left side of the sign.

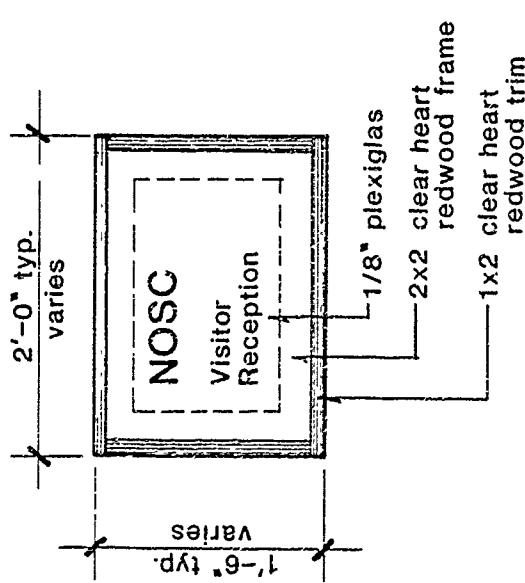
Provide one (1) inch of letter height of an upper case letter for each fifty (50) feet of viewing distance required. Do not exceed six (6) inches for letter height.

Free-standing signs shall utilize sign design and signage frame system indicated.

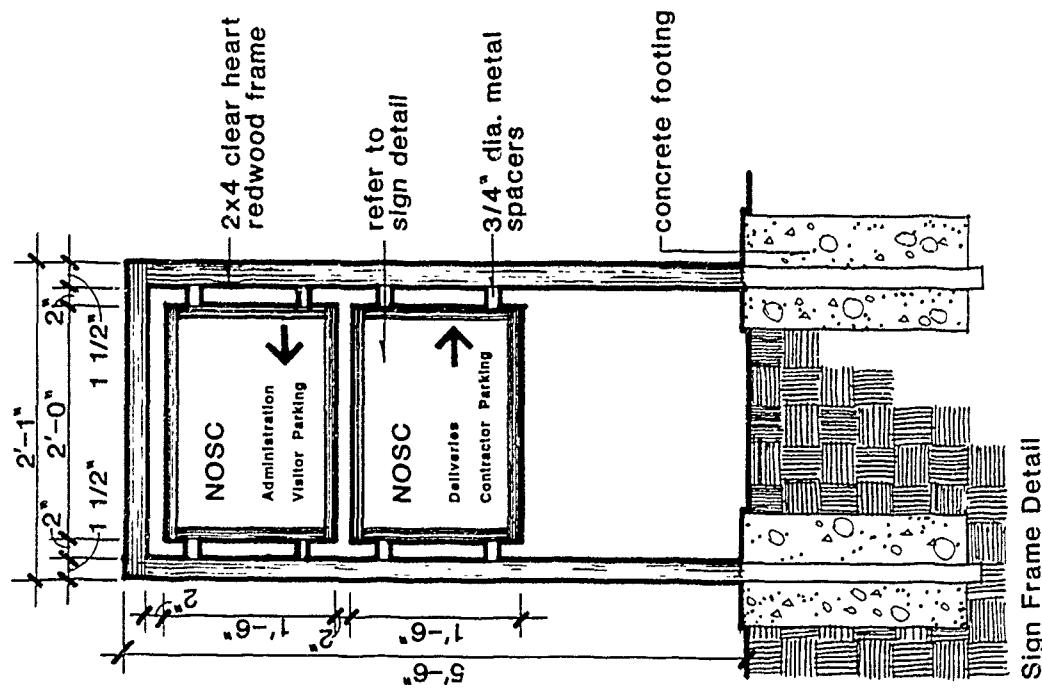
Free-standing signs (using frame) will be allowed only for vehicle control, entry, warning and directional signage.

Parking spaces, when marked, shall be marked on pavement, wheel stops or curb faces. No free-standing parking assignment signs will be allowed.

**Building Identification Signs.**  
All building identification signs to be attached directly to buildings per direction of MCAS Kaneohe Bay Fire Marshall. Otherwise, no stenciled signs on buildings shall be permitted.



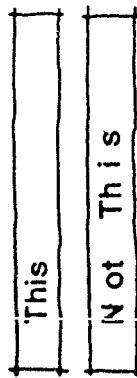
Typical Sign Detail



Sign Frame Detail

5-49

1' 2" 3" 4" 5" 6"  
 Viewing Distance  
 0' 100' 150' 200' 250' 300'  
 Letter Size



Letter Placement

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
 abcdefghijklm  
 nopqrstuvwxyz  
 1234567890  
 → ↗ ↘ ↙

Helvetica Regular Typeface

## 5.6 Screening

## 5.6 Screening

### A. Introduction

Many of the unsightly and cluttered looking aspects of the NOSC Hawaii Lab's exterior could be made more acceptable through the use of screening. Storage areas, trash containers, incinerators and similar functional necessities have a negative impact on the overall appearance of the Lab. All of these elements could benefit from screening with fences, walls and planting.

### B. Objectives

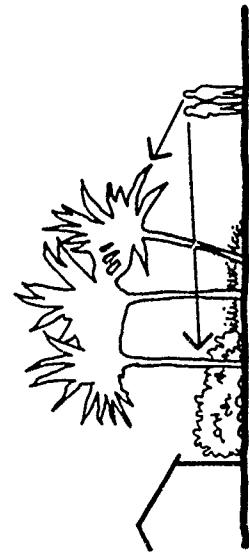
**Screen objectionable or unsightly areas from view.**  
Consolidate long term and short term storage in separate areas.

**Standardize screening elements**

**Use screening to enhance function**  
Screen to enhance appearance of buildings, control wind or create privacy as necessary (see 5.2 Landscape Planting Guidelines ).



Unsightly storage area



Screening

### C. Guidelines

#### Fencing.

Provide 8'-0" high articulated wood screen fence to screen storage areas.

Provide 5'-0" high wood screen fence for privacy screening as necessary

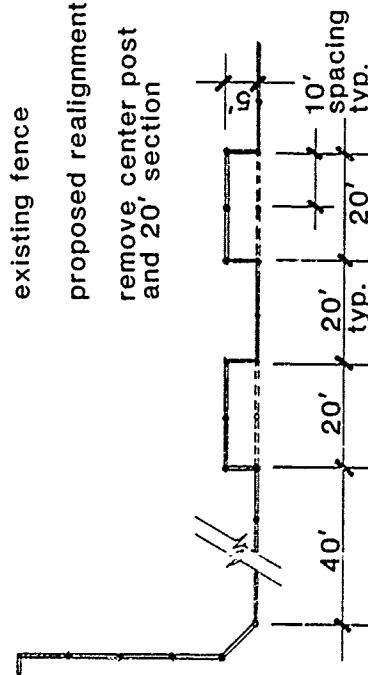
#### Plant Material.

Use plant material from preferred planting list for minor screening and view enhancement.

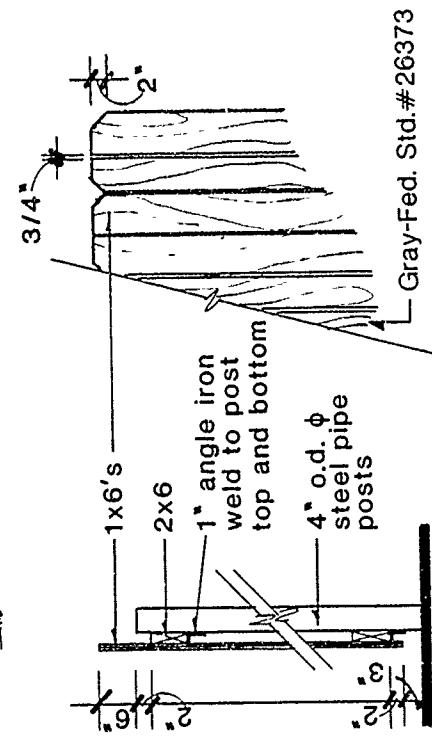
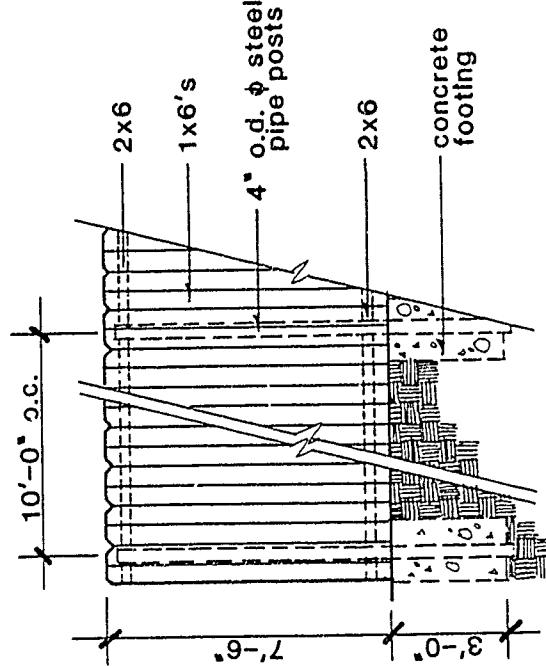
#### existing fence

#### proposed realignment

remove center post and 20' section



Main Entrance Fence Realignment



Fence Details

5.7 Site Furnishings

## 5.7 Site Furnishings

A. Introduction	B. Objectives
<p>Site furnishings include such elements as benches, picnic tables and traffic control bollards. A coordinated system of site furnishings can enhance the function and appearance of NOSC Hawaii Lab's exterior. The site furnishings should reflect the informal atmosphere of the facility using wood components constructed on site rather than pre-manufactured items whenever possible.</p>	<p><b>Provide comfortable outdoor furnishings</b> Design simple and easy to build furnishings appropriate to the scale and character of the NOSC Hawaii Lab.</p> <p><b>Consider environmental factors when designing site furnishings.</b> Minimize use of metal materials that may be subject to corrosion.</p> <p>Use wood materials as much as possible, with spaces provided between top members to minimize standing water.</p> <p>Use concrete footings for benches and picnic tables, especially in areas exposed to high wind conditions.</p> <p><b>Use a coordinated system of site furnishings.</b></p> <p><b>Carefully consider location of each furnishing and the design of its surroundings.</b> Take advantage of views out to Kaneohe Bay.</p> <p>Provide site furnishings at outdoor activity areas for the comfort, convenience and enjoyment of users.</p>

## C. Guidelines

**Benches**  
Construct bench using 4" x 4" wood post, 2" x 6" supports, 2" x 6" planks and 2" x 6" trim as per detail shown.

Attach supports to post with 3/8" dia. carriage bolts. Secure planks and trim with 10d nails. All metal fasteners shall be hot-dipped galvanized.

Set posts in 18" x 18" x 18" concrete footing with exposed aggregate finish

After fabrication, apply two coats clear wood sealer.

**Picnic Tables**  
Construct Table using 4" x 4" wood post, 2" x 4" supports, 2" x 6" planks and 2" x 4" trim as per detail shown. Construct seat as per bench detail.

Attach supports to post with 3/8" dia. carriage bolts. Secure planks and trim with 10d nails. All metal fasteners shall be hot-dipped galvanized.

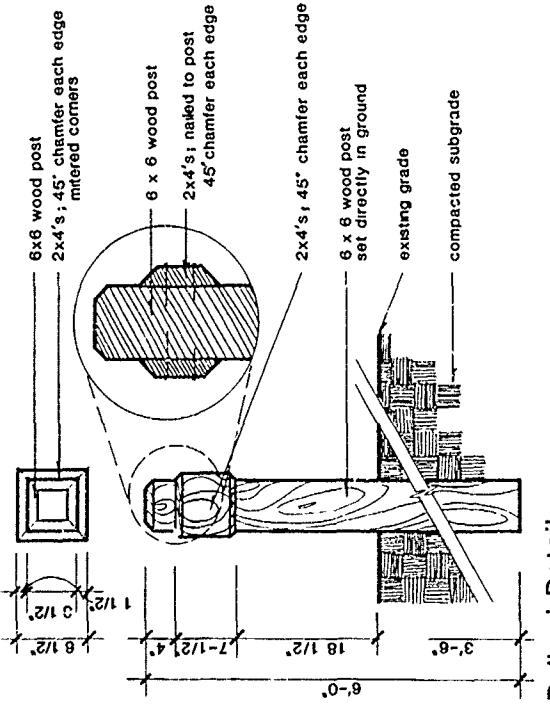
Set posts in 79.5" x 18" x 18" concrete footing with exposed aggregate finish.

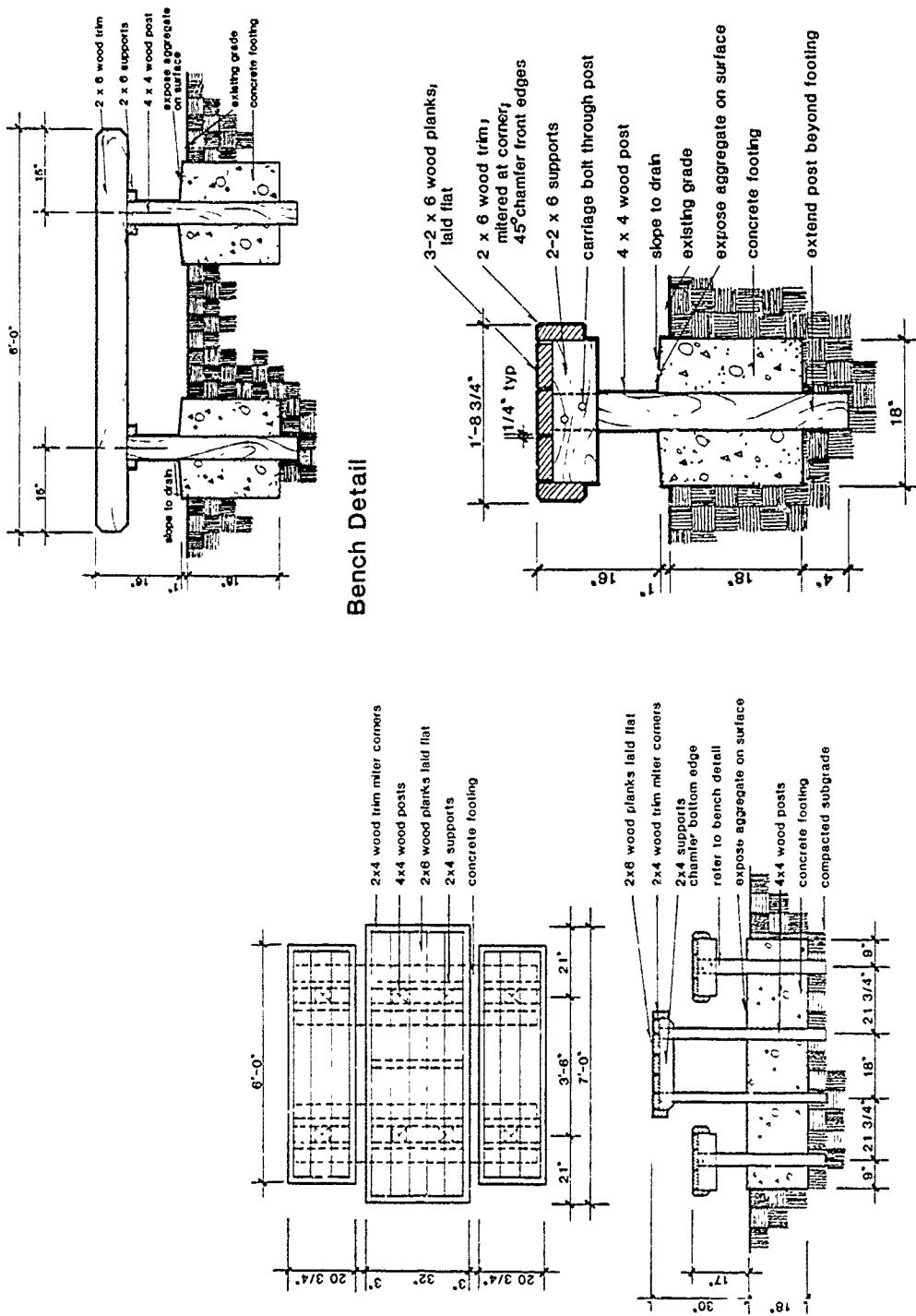
After fabrication, apply two coats clear wood sealer

**Bollards**  
Construct wood post bollards for traffic control (see section 5.3 Vehicular Circulation / Parking) as per detail shown.

After fabrication, apply two coats clear wood sealer.

Backfill and compact soil around bollard after installation.





## Table and Bench Detail

## 5.8 Utilities

## 5.8 Utilities and Equipment

### A. Introduction

Utility systems carry electrical power, water and communication services. Equipment includes power generators, electrical transformers, air conditioners and other similar devices. When not screened or painted these elements often have a negative impact on the appearance of the NCISC Hawaii Labs exterior.

### B. Objectives

Screen or bury unsightly utilities if feasible.

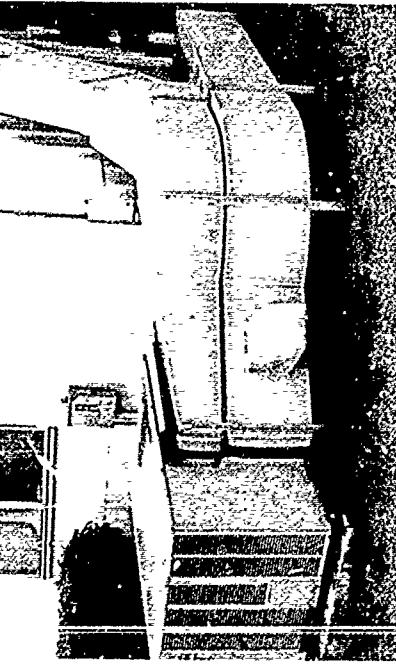
Improve the appearance of equipment.

Paint utilities and equipment.

### C. Guidelines

#### Painting

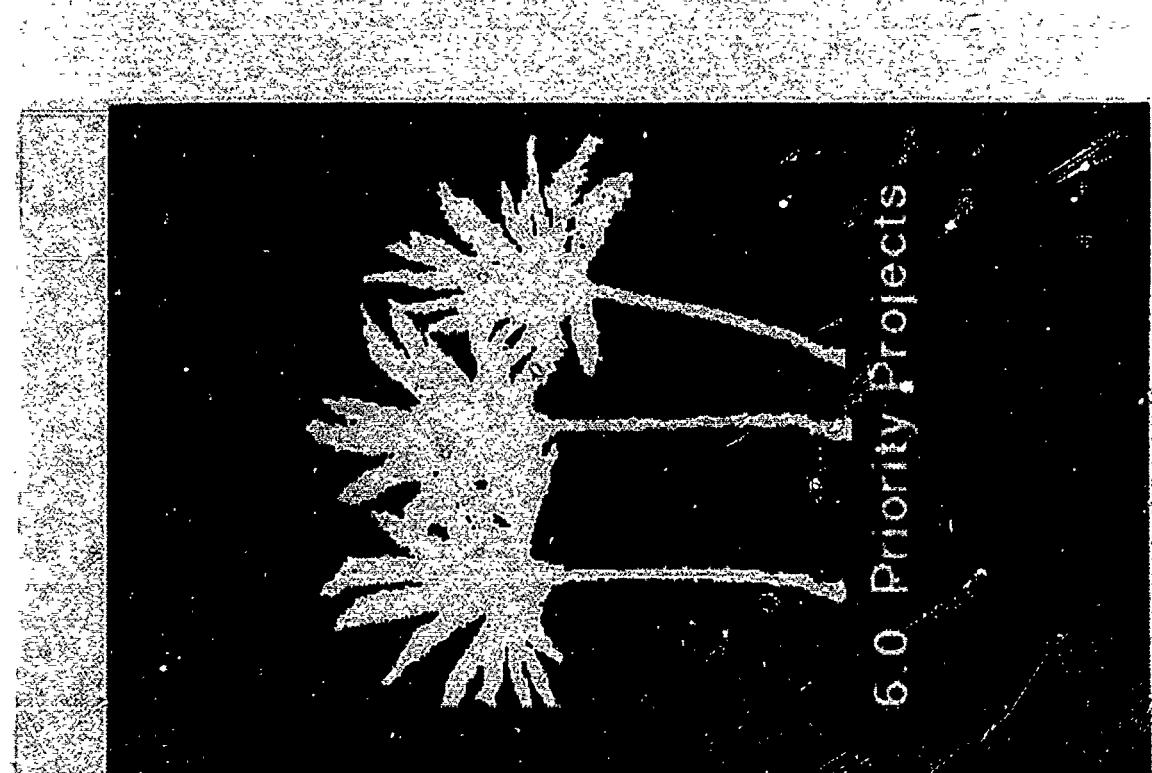
Paint minor utilities and equipment to match buildings, when directly adjacent or attached to building.



Air conditioning equipment

#### Screening

For larger scale utilities and equipment, screen with plant materials and wood fences.



## 6.0 Priority Projects

## 6.0 Priority Projects

This section illustrates the practical and coordinated application of design guidelines in improving and / or correcting functional and visual liabilities on the NOSC Hawaii Lab site. Several projects have been selected to demonstrate the use of the design guidelines in a variety of important opportunity areas. These projects were chosen on the basis of functional impacts on the use of the Lab site, visual importance to employees and visitors, and the probability of funding for construction.

These priority projects have been arranged in a priority sequence that is based on functional needs and most immediate importance to the visual success of the facility.

The highest priority projects are those that will have the greatest overall impact on the appearance of the Lab as seen by both visitors and NOSC employees. The *Covered Walkways* and the *Landscape Master Plan* are two projects that when implemented will improve and unify the exterior architecture of the Hawaii Lab.

The next priority areas are those which visually enhance the facility and help retain theme and character. The *Security / Visitor Building* is an area which demonstrates the need to organize, up-grade and revitalize high use areas. The *Main Entry*, which introduces the NOSC facilities to the visitor, serves as a project to demonstrate visual enhancement, while on the other hand, demonstrating the need for screening of objectionable visual ele-

ments like the adjacent storage areas. The *Main Plaza* is the most important "commons" area and most activities are organized about its axis. This commons area serves as an important open space area that serves as the main organizational core for the Hawaii Lab.

The last priority areas are ones which either retain and enhance passive view qualities or create new aesthetic, small scale people places. The *Bay Front* is an area that demonstrates the need to retain and enhance major views.

The Comprehensive Development Plan in the back of this document locates all of the priority projects and orients their locations to the overall NOSC site.

## 6.1 Covered Walkways

### Project Justification:

The NOSC Hawaii Lab facilities consist primarily of a large number of individual small buildings of diverse functions and disparate appearance. This wide variety of architectural elements presents the following problems:

- Lack of visual continuity and cohesiveness.
- The overall appearance of the facility is undermined.

### Solution:

The following improvements are proposed for the Covered Walkways:

- Provide a series of covered walkways connecting series of adjacent buildings in functional areas that are exposed to the main core area.
- Design of overhead structure to be simple enough to be constructed by station forces if necessary.
- Design of overhead structure to provide protection from the elements while maintaining an informal character.
- Comprehensive covered walkway plan at scale of 1" = 40'-0" in pocket at back of this document.

## 6.2 Landscape Master Plan

### Project Justification:

Thoughtful selection and placement of plant materials would serve to soften and unify the appearance of the Lab facility. Planting within the core area of the main compound is sparse and sporadic. Other planting issues include

### Solution:

The following improvements are proposed for the Landscape Master Plan:	The following improvements are proposed for the Landscape Master Plan:
• Thoughtful selection and placement of plant materials would serve to soften and unify the appearance of the Lab facility. Planting within the core area of the main compound is sparse and sporadic. Other planting issues include	• Use preferred plant material list developed in Design Guidelines section 5.2 to select appropriate plant material.
• The existing planting lacks continuity and interest. Repetitious use of plant materials with appropriate use of accents is needed.	• Use plant materials to provide shade, reduce glare, reduce wind velocities, screen undesirable views and provide visual accent.
• Irregular growth of Ironwood trees and overgrowth around perimeter fence presents security problem. Pruning is needed.	• Plant material to be identified by species and size for installation.
	• Comprehensive Planting Plans at scale of 1" = 20'-0" in pocket at back of this document.

### 6.3 Security/Visitor Building Site

#### Project Justification:

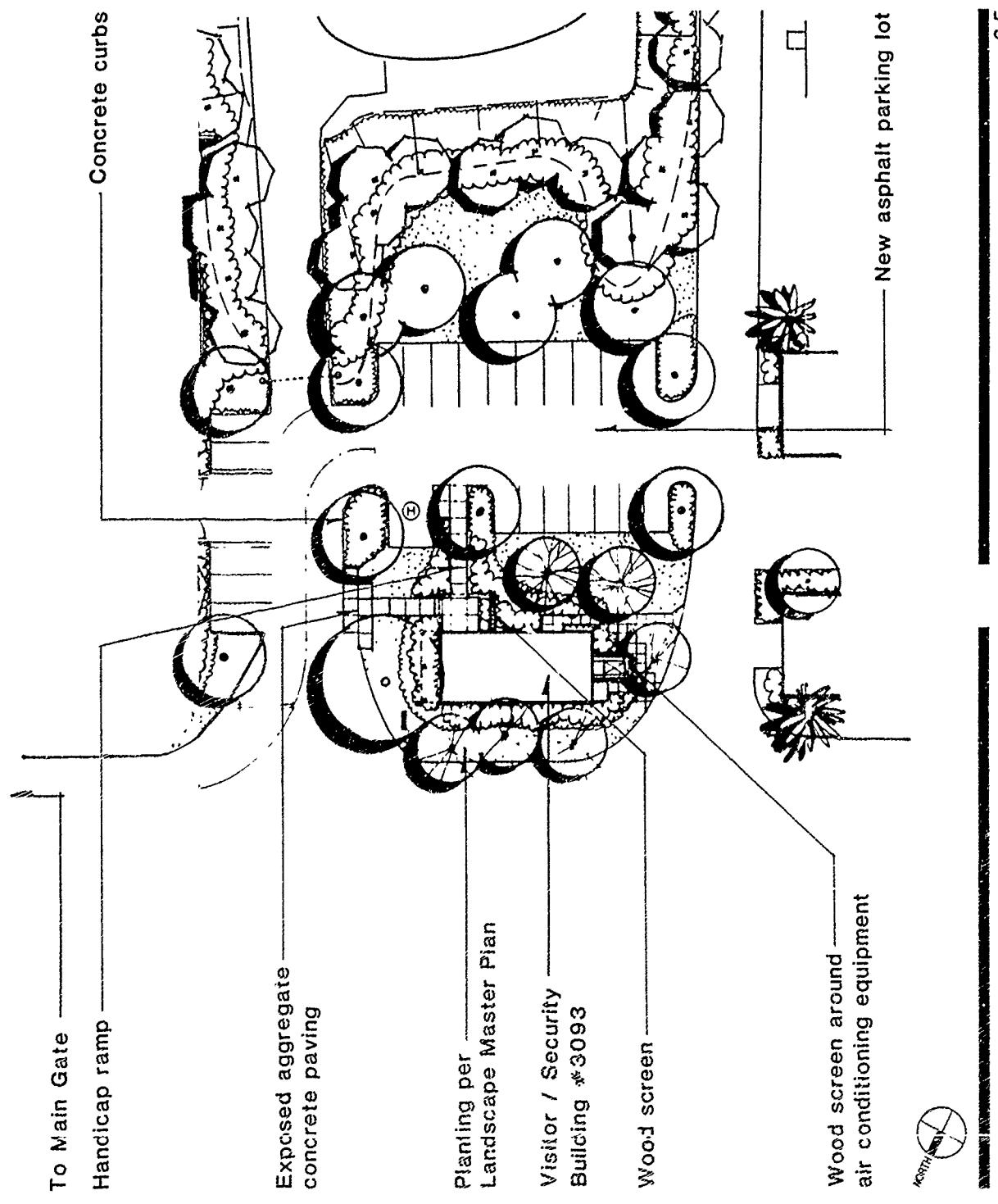
The Security/Visitor Building is an important element in the security of NOSC Hawaii Lab site. All visitors to the site must receive clearance at this building. Currently, the building site exhibits the following problems:

- The building and its immediate environs do not establish a sense of permanency nor a welcoming appearance to the visitor.
- The building entrance is on the side away from the main vehicular entry.
- No parking facilities exist.
- Handicap access is not available to the building.
- Surrounding adjacent sites are generally unappealing and unattractive.

#### Solution:

The following improvements are proposed for the Security/Visitor Building site:

- Provide a permanent parking lot for convenient use by visitors and staff of the Security/Visitor Building.
- Construct a handicap ramp to the building entrance to accommodate handicapped individuals.
- Landscape the site to accentuate the importance of the building's function, to accent the building's entrance and new parking area, and to create a pleasant environment for the visitor and the staff.
- Eliminate unattractive adjacent views by screening with fences and plantings.
- Provide identification and orientation signage.



## 6.4 Main Entry

### Project Justification:

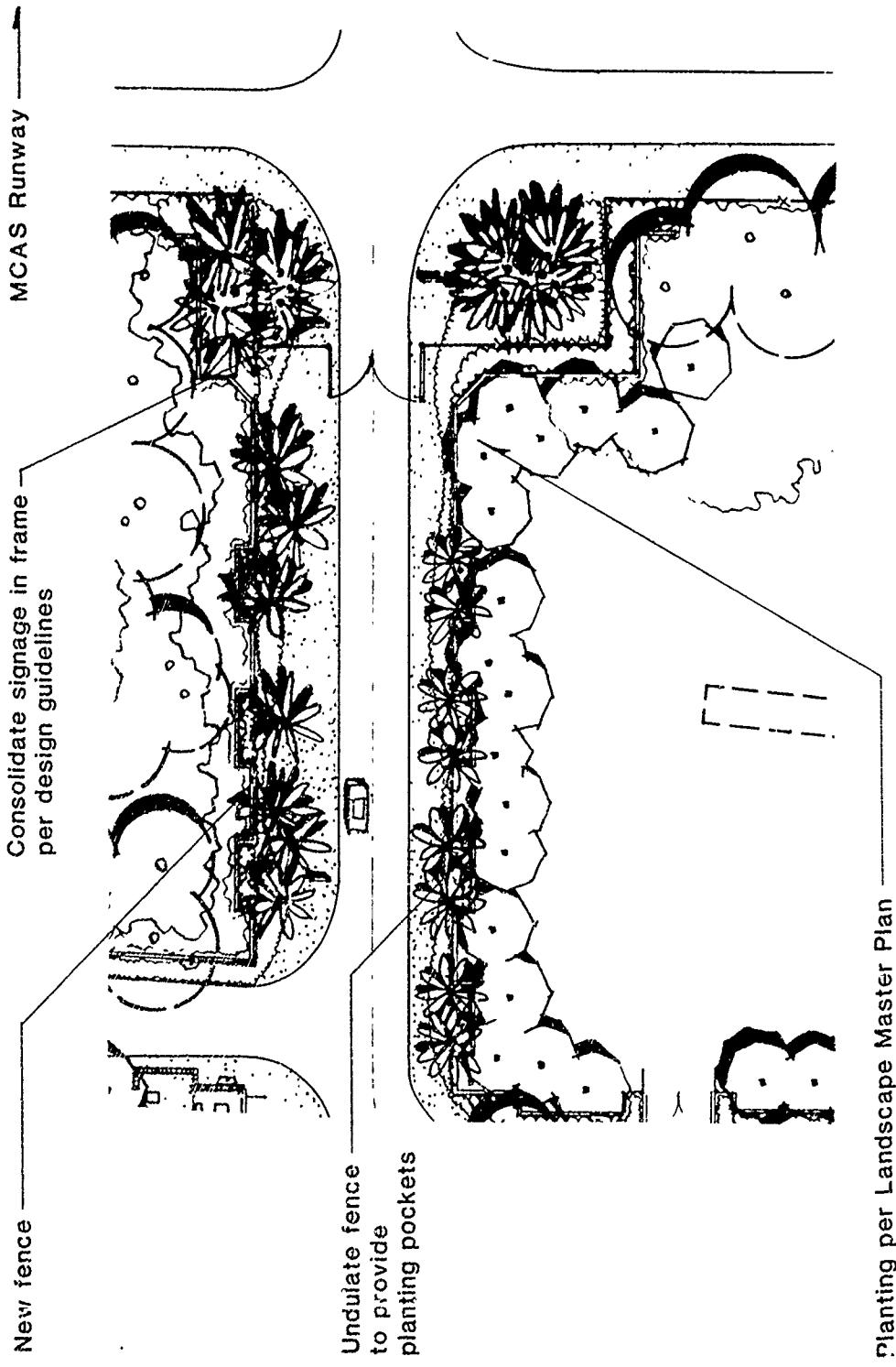
The entrance to the NOSC Hawaii Lab site is unpretentious and 'nondescript. Although the site is gated and is a security site, the gates remain open during the day. The distant view, as one approaches the entrance, falsely implies that one is entering an industrial complex. Upon traveling down the entrance drive, the adjacent storage areas provide an unattractive image of the site. The main entry has many minor problems including the following:

- The existing chainlink gates and fencing are very industrial in appearance.
- The directional and informational signs are unorganized and cluttered.
- The low-key and unpretentious scale to the entry is pleasant, but the present entrance plantings are nondescript and additional plantings are required to define the entry point.
- Immediately inside the entry gates, the adjacent sites are used for storage which creates an unattractive approach to the Security/Visitor Building. These storage areas require screening to develop an appealing approach drive.

### Solution:

The following improvements are proposed for the Main Entry:

- Upgrade the gates and fencing to provide an appealing appearance.
- Organize and construct new directional and informational signs to eliminate visual clutter at the point of entry. Sign graphics and colors are to conform to design guidelines.
- Upgrade entry plantings to define main entrance and to establish planting theme for the Lab site.
- Rework existing fence screen to provide articulation and interest, and construct new articulated fence screen on the opposite side of the entrance drive to eliminate view into storage area.
- Provide additional screen planting along each side of the entrance drive to create large scale screening of the storage areas.



Administration Building #1181

Add planter and curb

Covered walkway

Remove existing  
curb

Restripe parking

New concrete curb

Tree wells 4'x4'

Building #1018

Cafeteria Building  
#11638

Planting per Landscape Master Plan



6-8

## 6.5 Main Plaza

### Project Justification:

The core area of NOSC Hawaii Lab site is characterized by its large scale parking lot, many unconnected architectural elements, and the lack of landscape planting. More specifically, these problems include

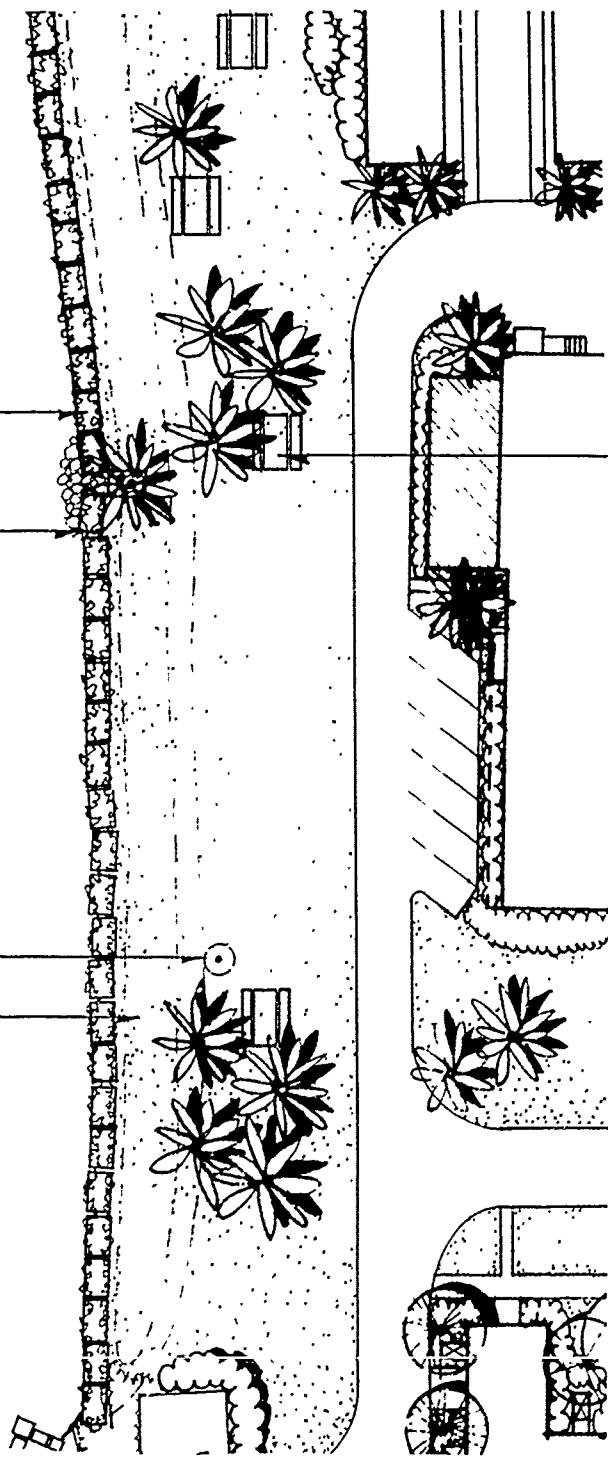
- The paving dominates the site and needs to be softened.
- The parking stalls are inefficiently laid out.
- Pedestrian circulation is undefined and forces the pedestrian onto vehicular traffic surfaces.
- The buildings that surround the parking lot are disconnected and unrelated.
- The large parking area needs shade trees to soften the visual impact of the paving and parked vehicles.
- Vehicles park against the building and no planting relief along the structure exists.

### Solution:

The following improvements are proposed for the Main Plaza:

- Reorganize the parking lot for more efficient parking.
- Remove excess paving to create planting and pedestrian spaces.
- Develop a pedestrian colonnade structure to serve a dual purpose, i.e., to create an architectural connection between the many buildings and to provide or define pedestrian circulation system.
- Introduce planting within the parking lot to shade and soften the parking lot's impact.
- Landscape against the buildings to provide visual relief and interest.

Remove existing Ironwood  
Fill soil to roll up lawn to  
top of concrete boxes



New picnic tables per design guidelines



6-10

## 6.6 Bay Front

### Project Justification:

The panoramic view of Kaneohe Bay from the NOSC Hawaii Lab facilities is dramatic. This view is the major asset of the site and should be retained at all reasonable costs. Although this view is spectacular, it could be enhanced with a minimum of additional effort. To insure and upgrade this vital view of the bay, the following conditions should be addressed:

- The existing concrete boxes, which act as wave attenuators along the shoreline, are in need of repair, especially where wave action has eroded several pockets into the edge.
- The concrete boxes are unevenly placed and create an impression of haphazard placement that detracts from the view of the bay.
- Planting and irrigation in the boxes have eroded away and the boxes stand empty.
- Several elements, including a bushy tree, interfere with the panoramic view.

### Solution:

The following improvements are proposed for the Bay Front:

- Repair the existing concrete boxes and concrete fill and riprap the spaces between boxes to eliminate wave erosion.
- Fill concrete boxes with appropriate soil and materials to support planting.
- Furnish fill soil and roll up lawn grade to hide haphazard and uneven placement of concrete boxes.
- Plant and irrigate boxes to provide aesthetic landscape edge at the shoreline.
- Remove elements which detract or interfere with the panoramic view of the bay.

7.0 Implementation

## **7.0 Implementation**

### **7.1 Priority Project Cost Estimates**

The design guidelines that have been presented in this document will achieve the desired effect only if they are implemented. The priority projects described in section 6.0 provide a means for implementing, in an expeditious manner, some of these design guidelines. As these projects are built and as the guidelines are implemented through other new or maintenance and repair projects, an expression of continuity will begin to form, and the intent of the **Base Exterior Architecture Plan** will be realized.

The following cost estimates for priority projects are based on schematic development plans and accordingly represent rough approximations of the anticipated cost of construction. These cost projections are based on current prices (7/88) and are to be adjusted as necessary if implementation takes place in the future. A 10% contingency has been added, and all numbers have been rounded off. Larger projects such as the Landscape Master Plan may be phased as necessary depending on available funding. Each estimate includes a brief description of project scope.

### **Covered Walkways**

This project includes overhead structures (constructed of wood, metal roof deck material and concrete footings), minor demolition and the construction of asphalt/concrete walks with redwood headers.

Phase One	Item	Qty.	Unit Cost	Total
Demolition	Allow	1500	3.25/SF	2000
Asphalt walks		830	200/LF	4875
Overhead structure				166000
Contingency	10%			17288
<b>Total</b>				<b>\$190,163</b>

Phase Two	Item	Qty.	Unit Cost	Total
Demolition	Allow	350	3.25/SF	1500
Asphalt walks		460	200/LF	1140
Overhead structure				92000
Contingency	10%			9464
<b>Total</b>				<b>\$104,104</b>

### **Landscape Master Plan**

This project includes the furnishing and installation of trees, shrubs and groundcovers.

Item	Qty.	Unit Cost	Total
Clearing / Grubbing		85338	0.10/SF
Soil preparation		85338	0.30/SF
15' B.T. Palms	71	1300/EA	92300
25 Gal. Trees	116	325/EA	37700
15 Gal. Trees	78	130/EA	390
05 Gal. Trees	15	30/EA	450
05 Gal. Shrubs	673	15.50/EA	10432
01 Gal. Shrubs	963	6.50/EA	6260
Groundcover		54225	.30/SF
Lawn (seeded)		31113	.15/SF
Maintenance (60 days)		85338	.04/SF
Contingency	10%		20687

### Security / Visitor Building

This project includes construction of asphalt parking lot with 6" concrete curbs, handicap ramp, exposed aggregate concrete paving, wood screens and signage.

Item	Qty.	Unit	Cost	Total
Grading	15000	0.10/SF	1500	
6" conc. curb	610	9/SF	5490	
Handicap ramp	1	600/EA	600	
3 1/2" exp. ag. paving	1020	4/SF	4080	
Asphalt paving	5820	2.25/SF	13095	
Wood screen	50	20/LF	1000	
Signage	allow		1000	
Contingency	10%		2680	
<b>Total</b>				<b>\$29,445</b>

### Main Entry

This project includes modification of existing wood fence, construction of new wood fence and new signage.

Item	Qty.	Unit	Cost	Total
Demolition (salvage)	allow			500
Wood fence	420	30/LF	12600	
Signage	allow		1000	
Contingency	10%		1410	
<b>Total</b>				<b>\$15,510</b>

### Main Plaza

This project includes demolition of existing concrete curbs, repair of asphalt paving, construction of new concrete curbs and restriping of parking lot.

Item	Qty.	Unit	Cost	Total	Item	Unit	Cost	Total
Demolition of curbs	470	1.50/LF	705		Clear / Grub	7800	0.10/SF	780
Repair asphalt	1600	2.50/SF	4000		Repair concrete boxes	allow		1500
6" concrete curbs	480	9/LF	4320		Grading	7800	0.10/SF	780
Restriping	1150	0.25/SF	285		Fill soil	770	20/CY	15400
					Repair lawn	7800	0.5/SF	390
					Picnic benches	4	600/EA	2400
Contingency	10%				Contingency	10%		
<b>Total</b>				<b>\$10,240</b>				

Total

\$23,375

### Bay Front

This project includes repair of existing concrete wave attenuators, fill concrete boxes with topsoil, bring in topsoil fill, repair lawn and construct picnic benches.

Item	Qty.	Unit	Cost	Total	Item	Unit	Cost	Total
Demolition of curbs	470	1.50/LF	705		Clear / Grub	7800	0.10/SF	780
Repair asphalt	1600	2.50/SF	4000		Repair concrete boxes	allow		1500
6" concrete curbs	480	9/LF	4320		Grading	7800	0.10/SF	780
Restriping	1150	0.25/SF	285		Fill soil	770	20/CY	15400
					Repair lawn	7800	0.5/SF	390
					Picnic benches	4	600/EA	2400
Contingency	10%				Contingency	10%		
<b>Total</b>				<b>\$10,240</b>				

Total

\$23,375

## 7.2 Project Evaluation Checklist

The following Evaluation Checklist serves as a summary of the design and planning objectives that the Design Guidelines seek to achieve. This checklist provides a means to formulate a complete program for specific projects and as a tool for use by A&E consultant to insure compliance with the Design Guidelines.

### Buildings / Site Planning

- Is the site plan compatible with natural and environmental factors?
- Is the site plan compatible with the existing development pattern and character of the area?

- Does the site plan make the most efficient use of available land?
- Does the site plan maintain view corridors especially out to Kaneohe Bay?
- Is the new building compatible in size, style and material with adjacent buildings?
- Does the building incorporate passive and active energy conservation methods?

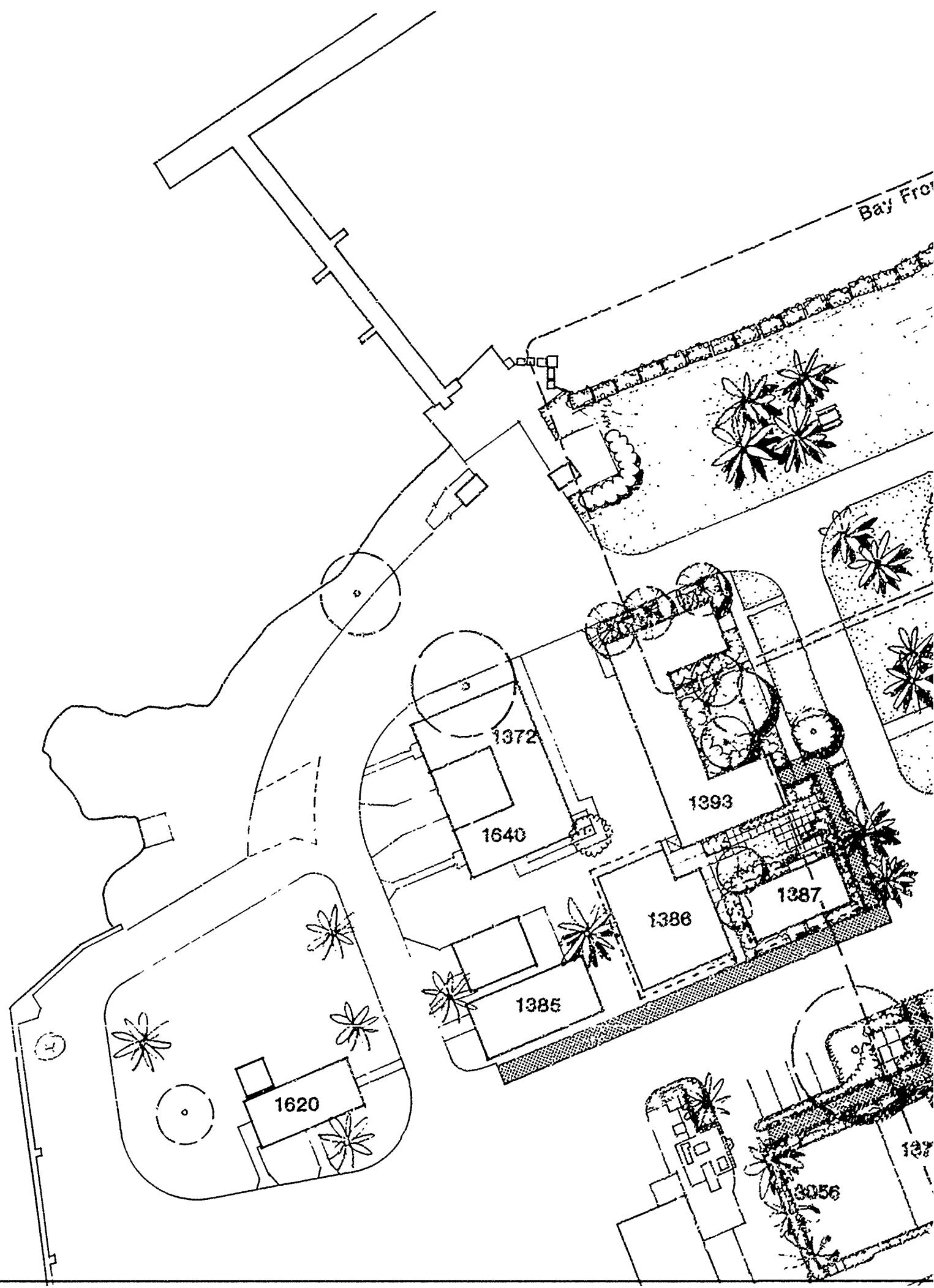
### Landscape Planting

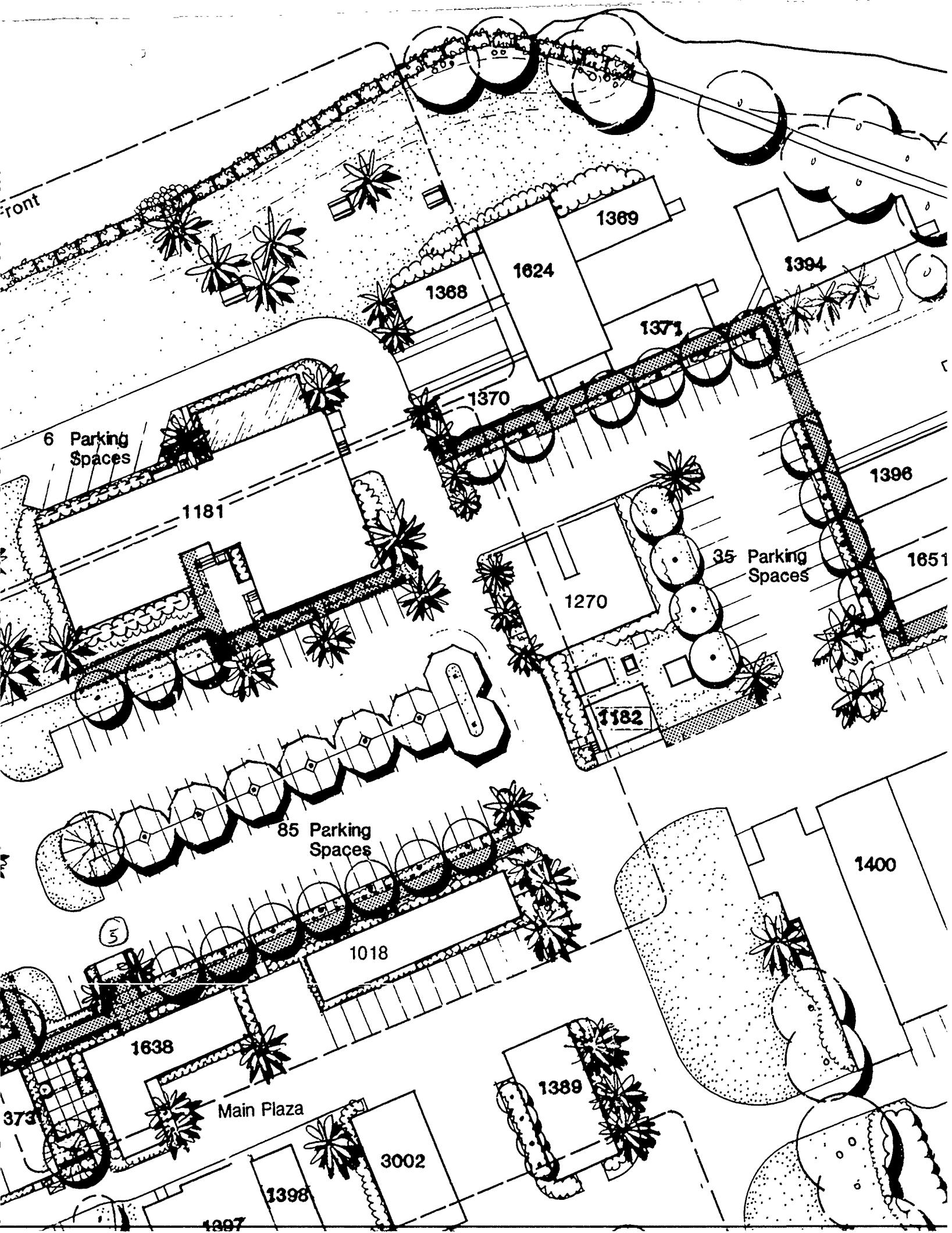
- Is the proposed planting in conformance with the Landscape Master Plan?
- Are the proposed plant materials on the preferred plant material list?
- Does the planting design contribute to the functional and aesthetic qualities of the site?
- Is an adequate budget included in the project for the landscape improvements?

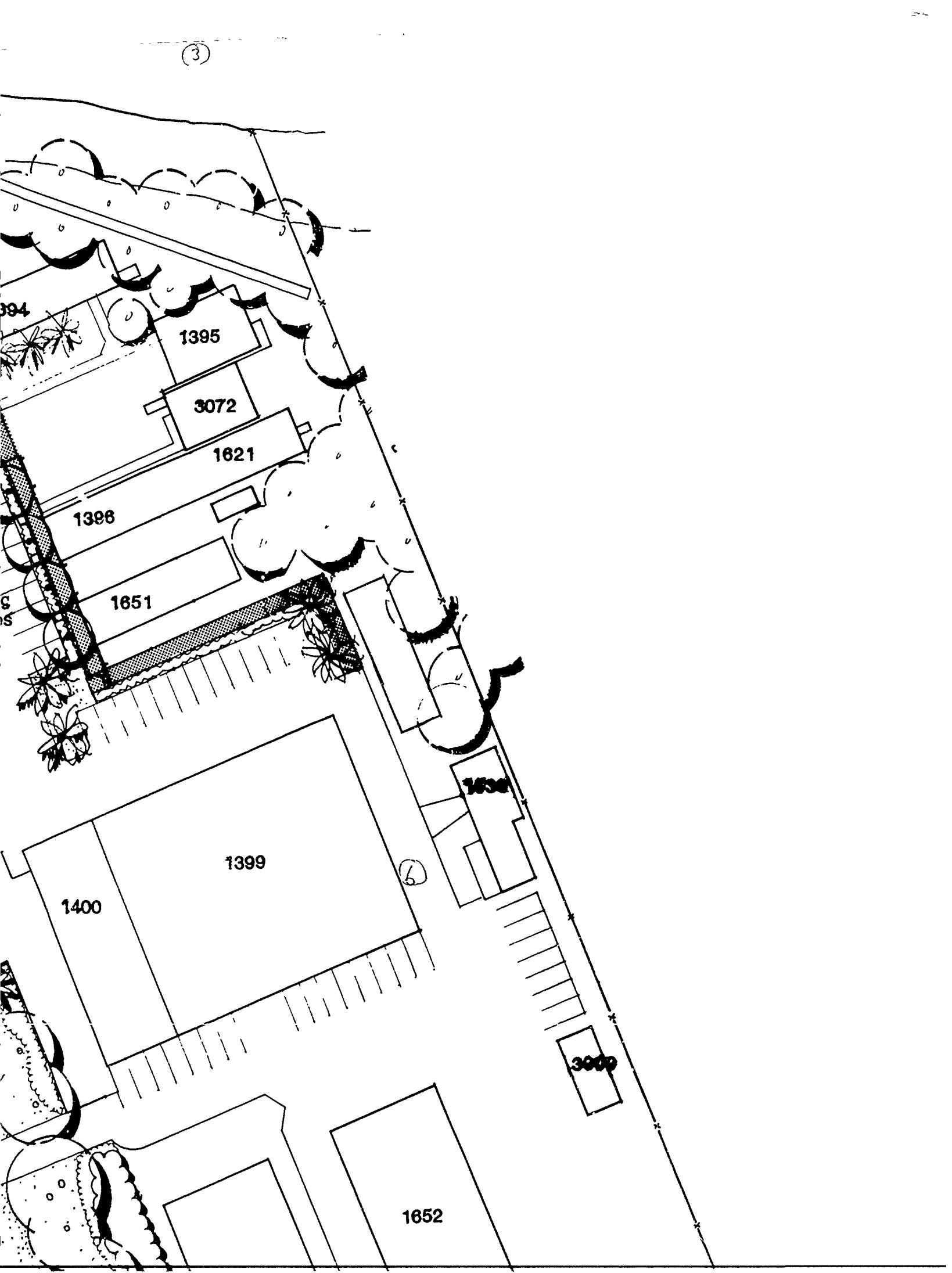
### Vehicular Circulation / Parking

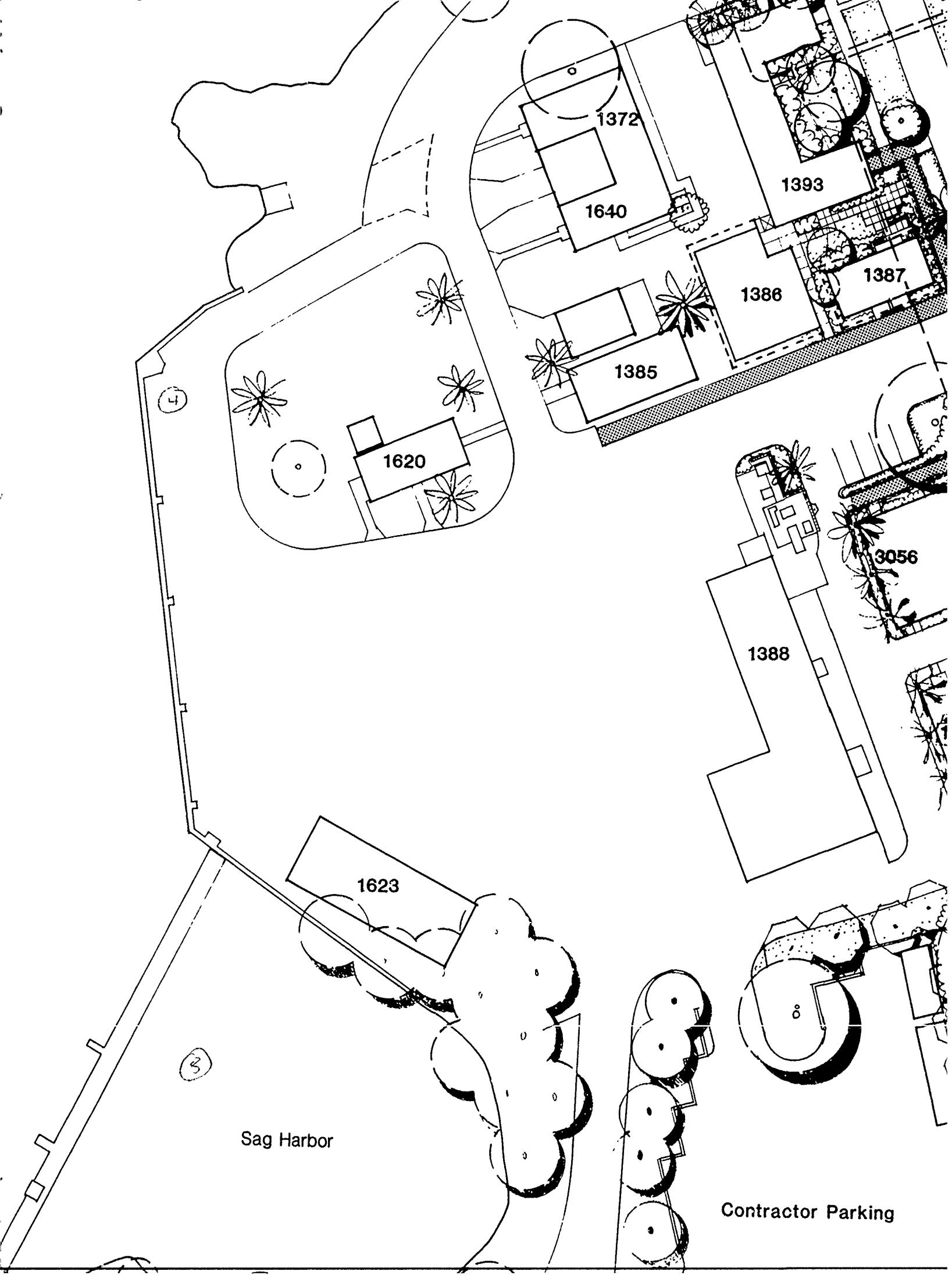
- Does the project result in an improved streetscape appearance?
- Does the project provide for adequate parking on site?
- Are traffic control measures, such as bollards, used to prevent random parking?
- Has plant material been used to reduce the visual impact of the parking?

<b>Pedestrian Circulation</b>		<b>Screening</b>	
<input type="checkbox"/>	Is the safety of pedestrians provided for within the project area?	<input type="checkbox"/>	Have unlighted areas been screened from view?
<input type="checkbox"/>	Is the project compatible with the covered walkway plan?	<input type="checkbox"/>	Have plant materials been used correctly to screen undesirable views?
<input type="checkbox"/>	Are new walks consistent in design and materials with the Design Guidelines?	<input type="checkbox"/>	Have fences or walls been used effectively to screen?
<b>Signage</b>		<b>Site Furnishings</b>	
<input type="checkbox"/>	Do signs for the project conform with existing sign standards for design and materials?	<input type="checkbox"/>	Have appropriate site furnishings been provided as a part of the project?
<input type="checkbox"/>	Do the building identification signs conform with MCAS Kaneohe Bay regulations?	<input type="checkbox"/>	Do the site furnishings conform with the Design Guidelines?
<input type="checkbox"/>	Are the signs properly located for visibility, safety and appearance?	<input type="checkbox"/>	Are the site furnishings properly located for user comfort, safety and enjoyment?
<b>Utilities and Equipment</b>		<b>Utilities and Equipment</b>	
<input type="checkbox"/>	Is each sign absolutely necessary, or can signage be simplified?	<input type="checkbox"/>	Has the visual impact of utilities been minimized by screening or undergrounding?
<input type="checkbox"/>		<input type="checkbox"/>	Has the appearance of utilities and equipment been improved with painting?



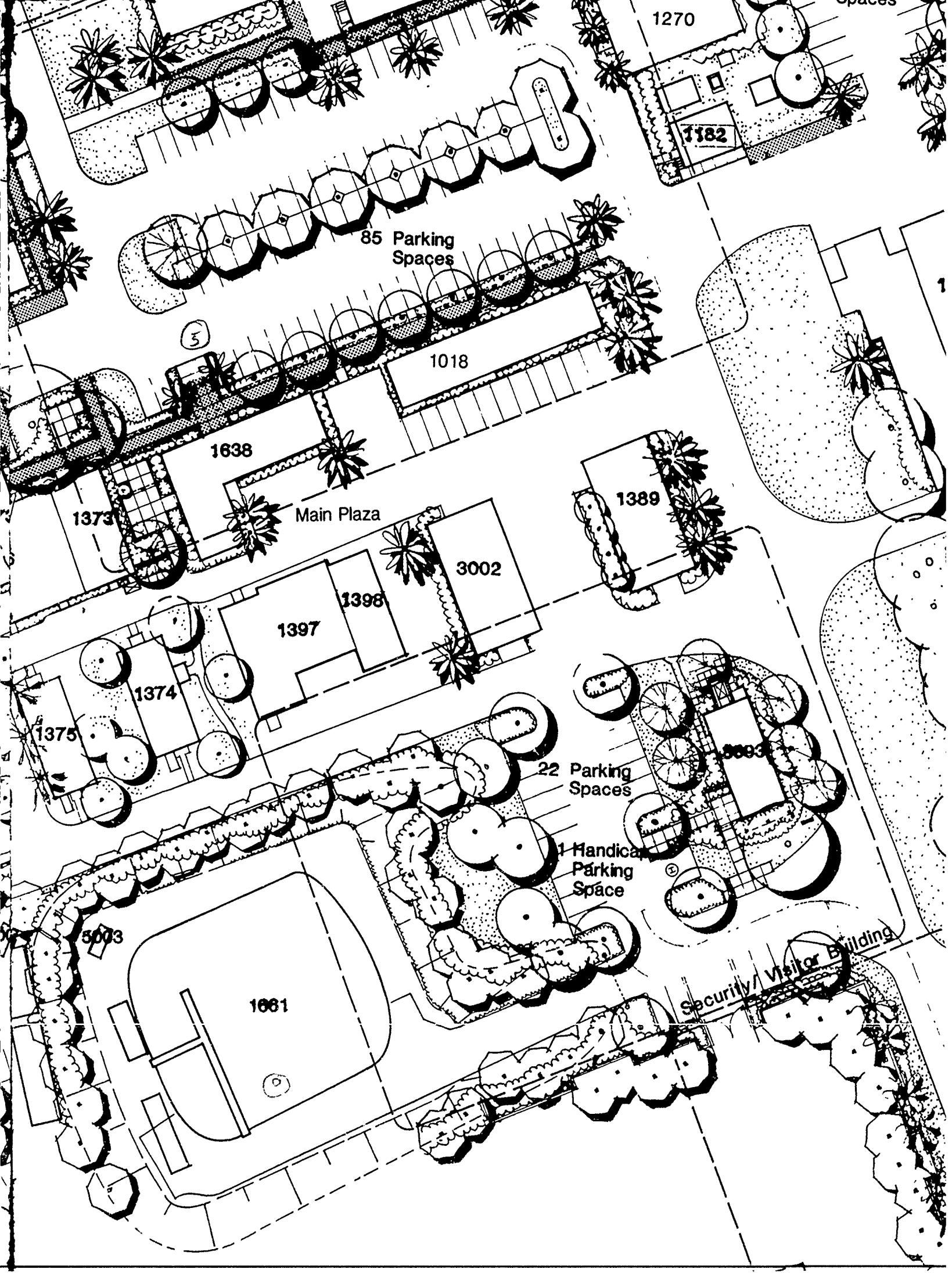


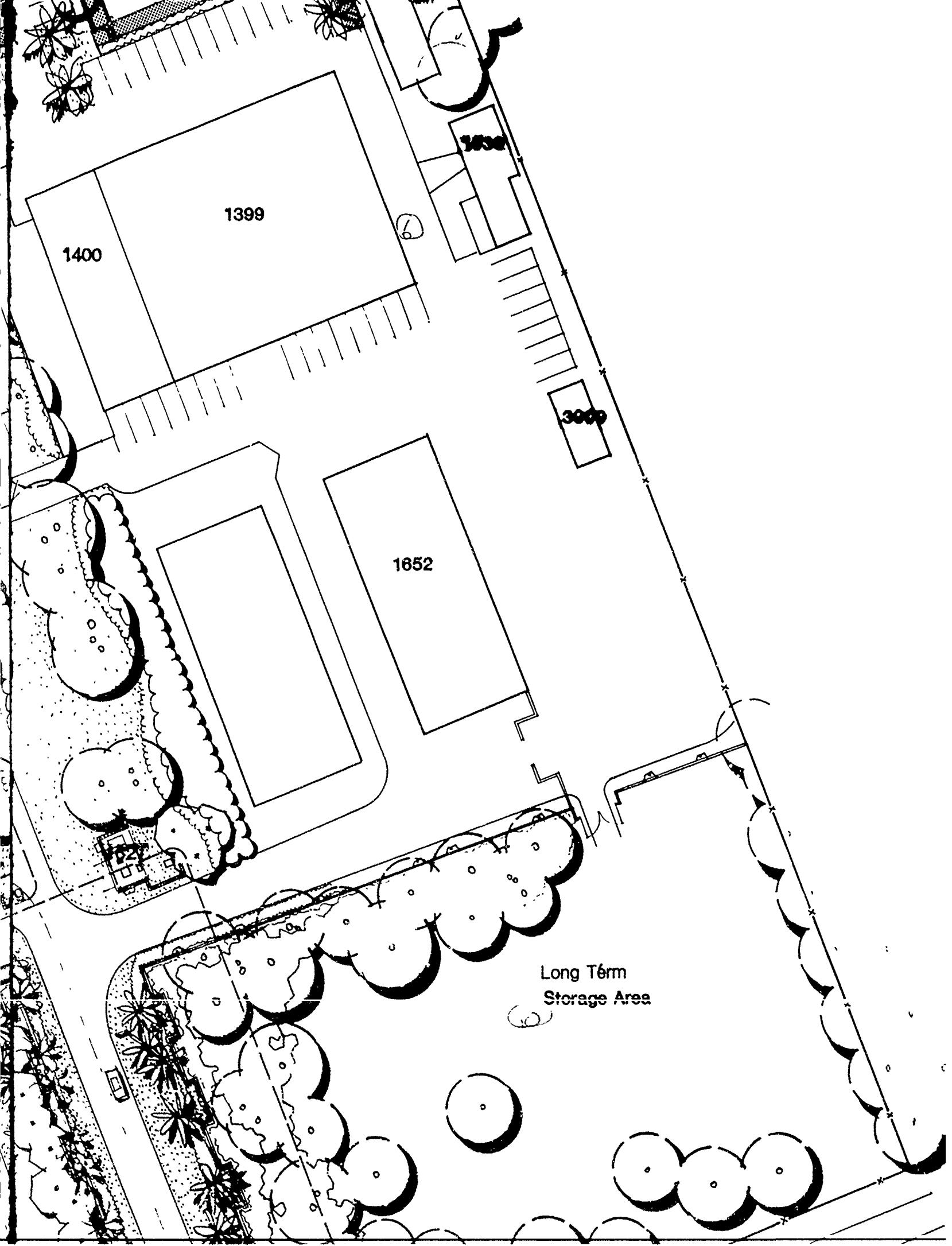


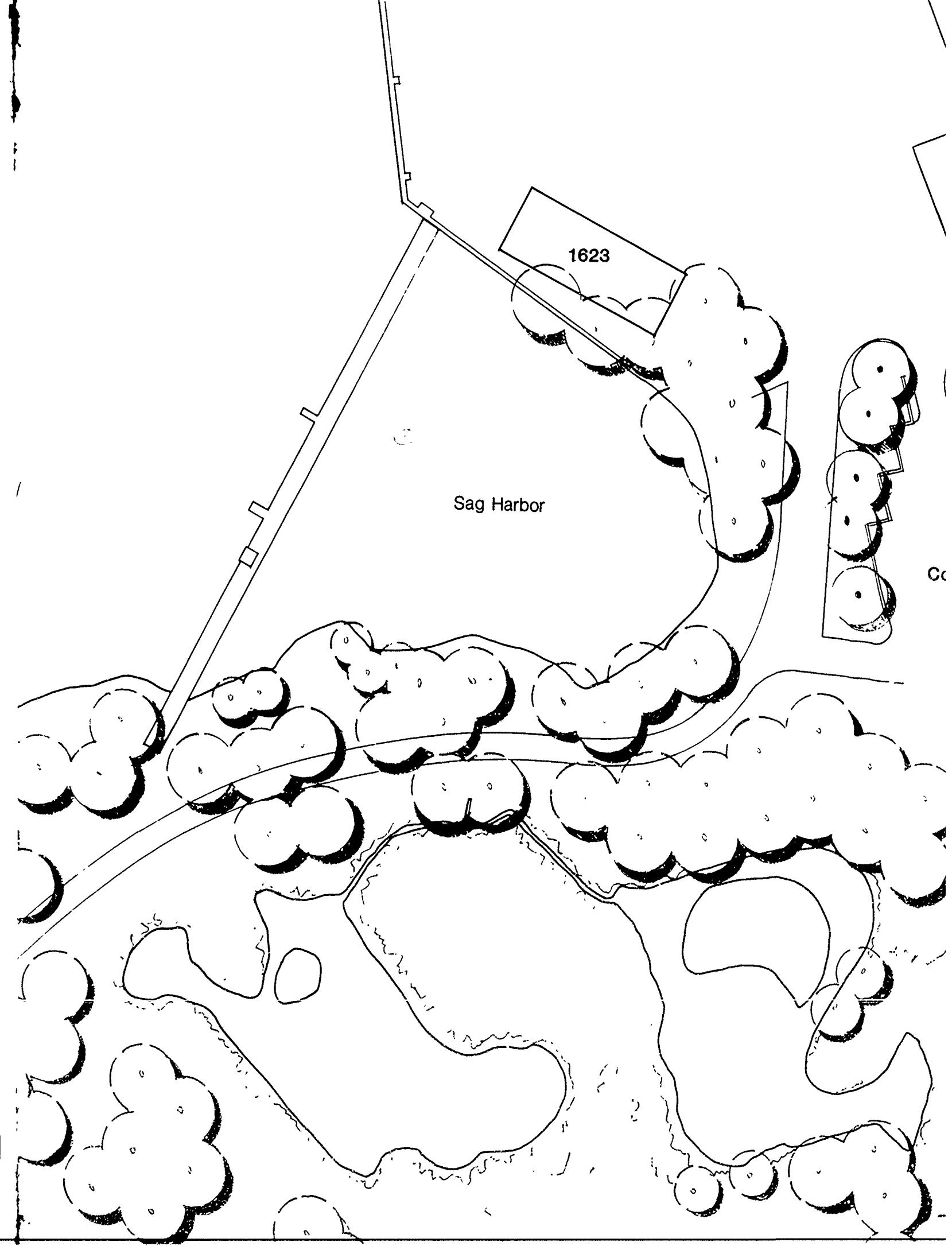


Sag Harbor

Contractor Parking

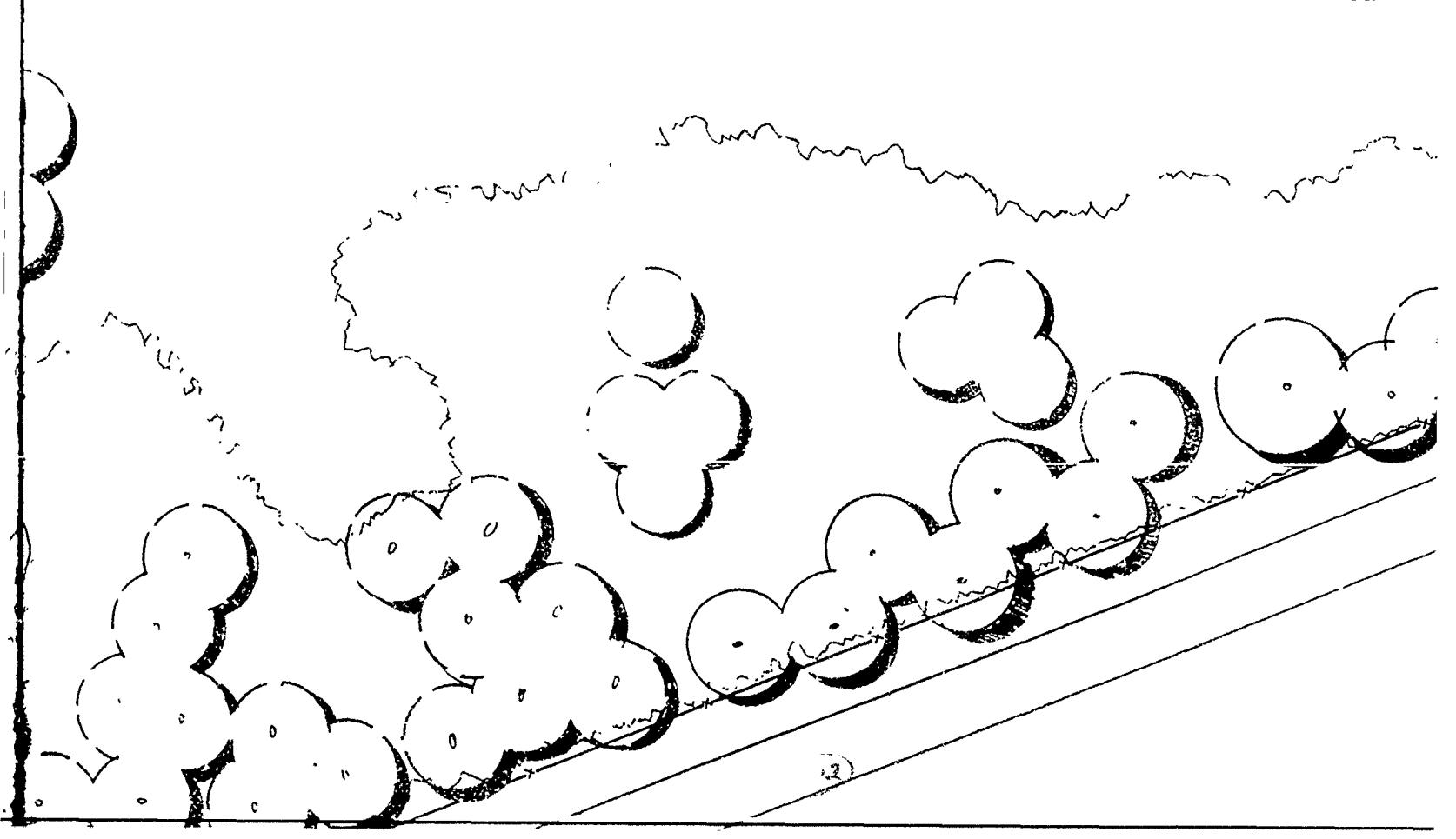
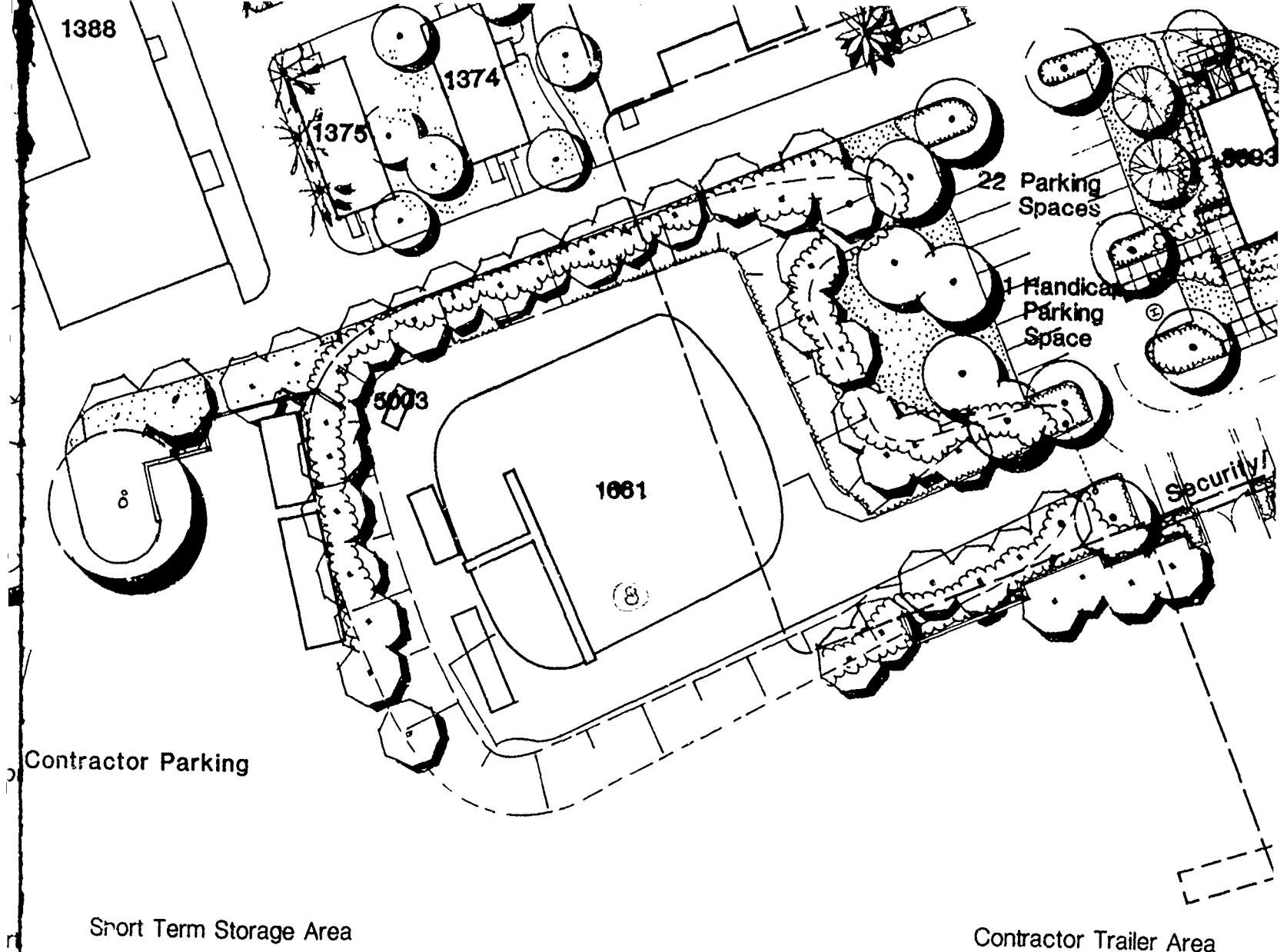


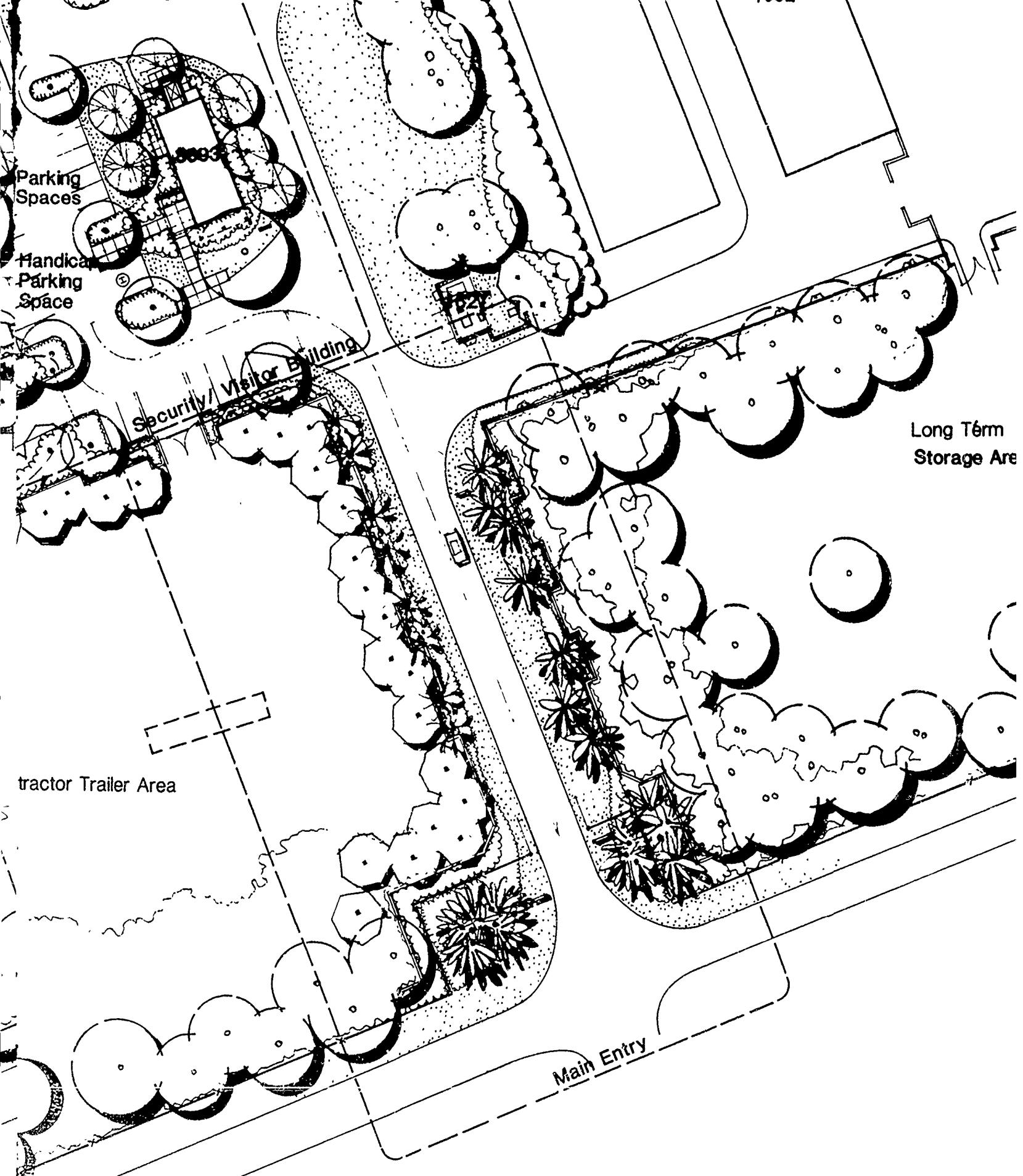




1623

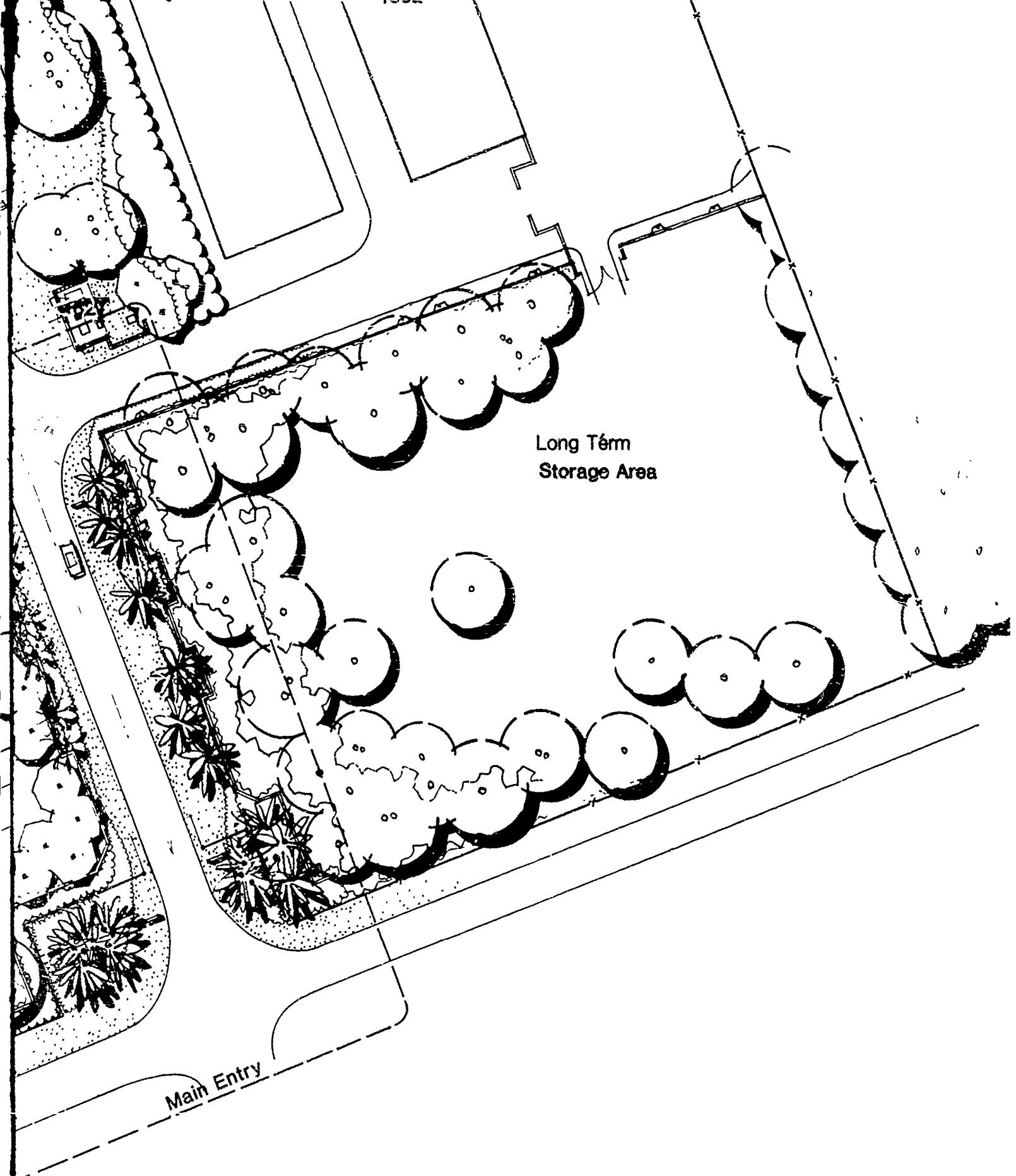
Sag Harbor





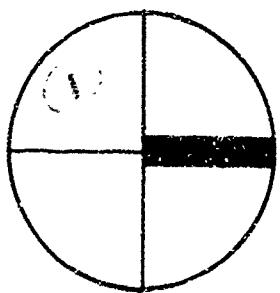
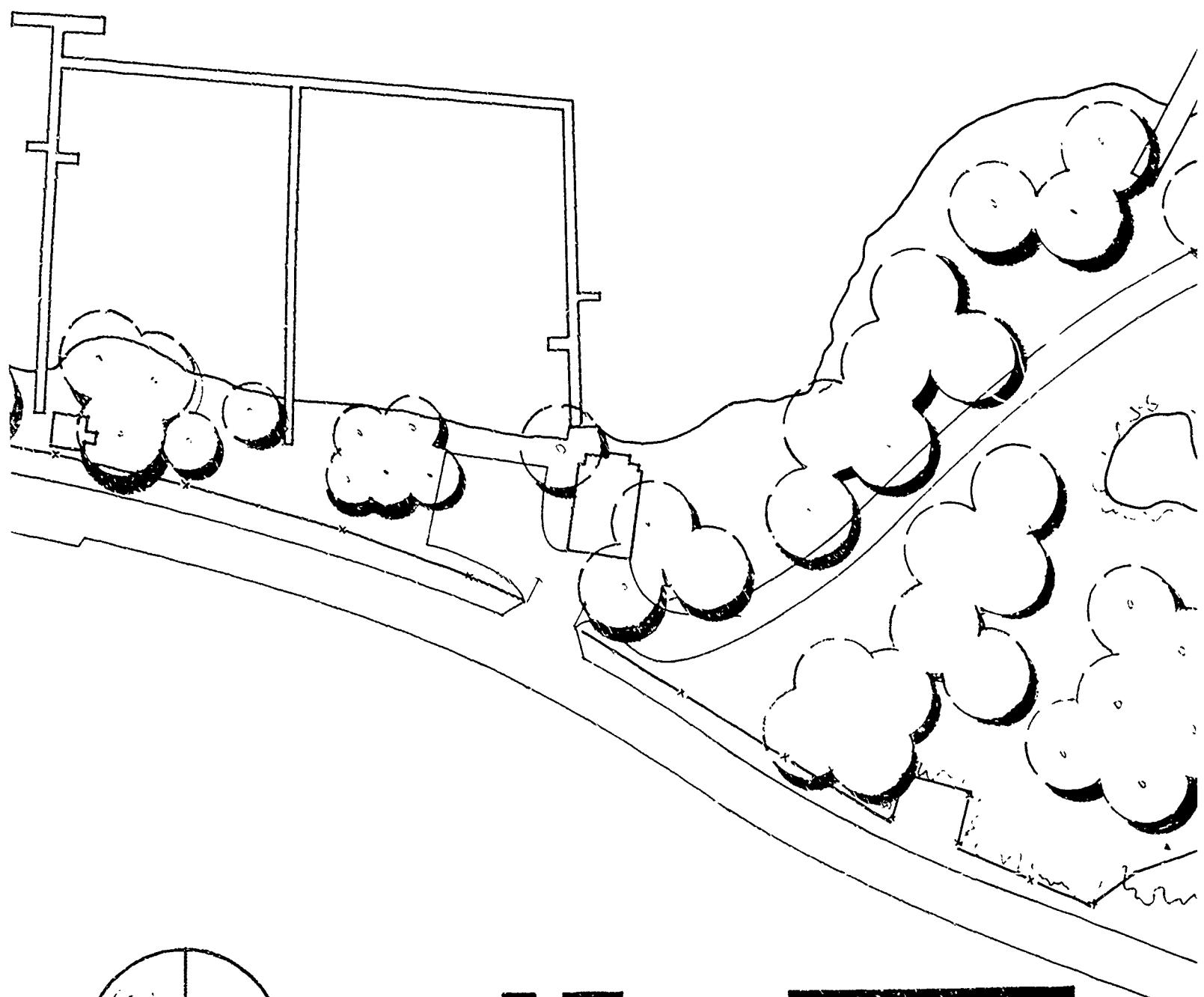
# Developme

Farm Road Ext

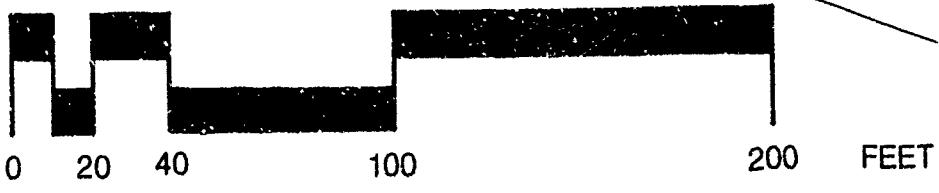


# Development Plan

For Rose Exterior Architecture



NORTH



200 FEET

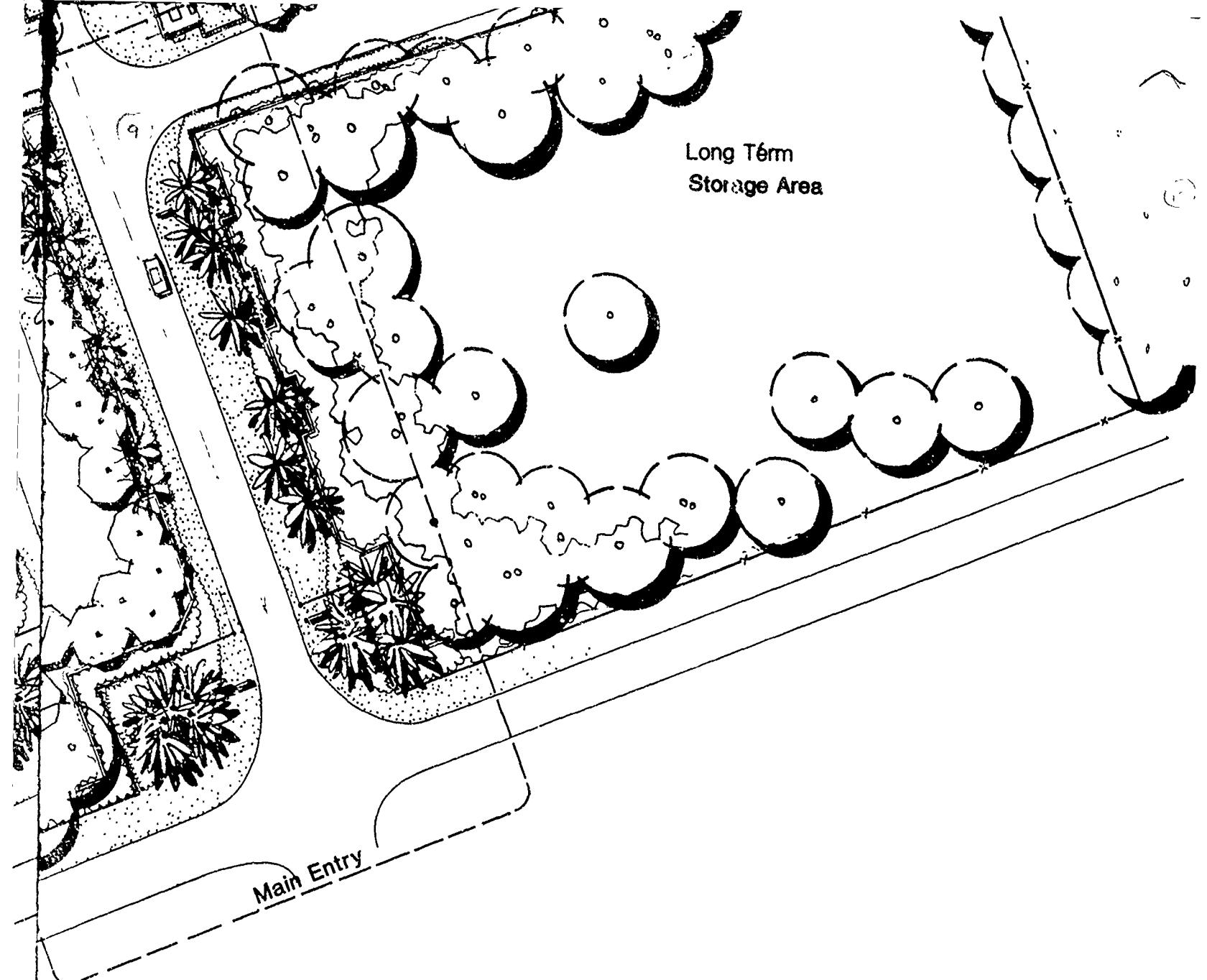
Sag Harbor

Contractor Parking

Short Term Storage



Naval C



# Development Plan

For Base Exterior Architecture

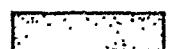
**Ocean Systems Center**  
Hawaii Laboratory

## LEGEND

 Proposed overhead structure

 Proposed asphalt walkways

 Exposed aggregate concrete paving

 Crushed coral walkways

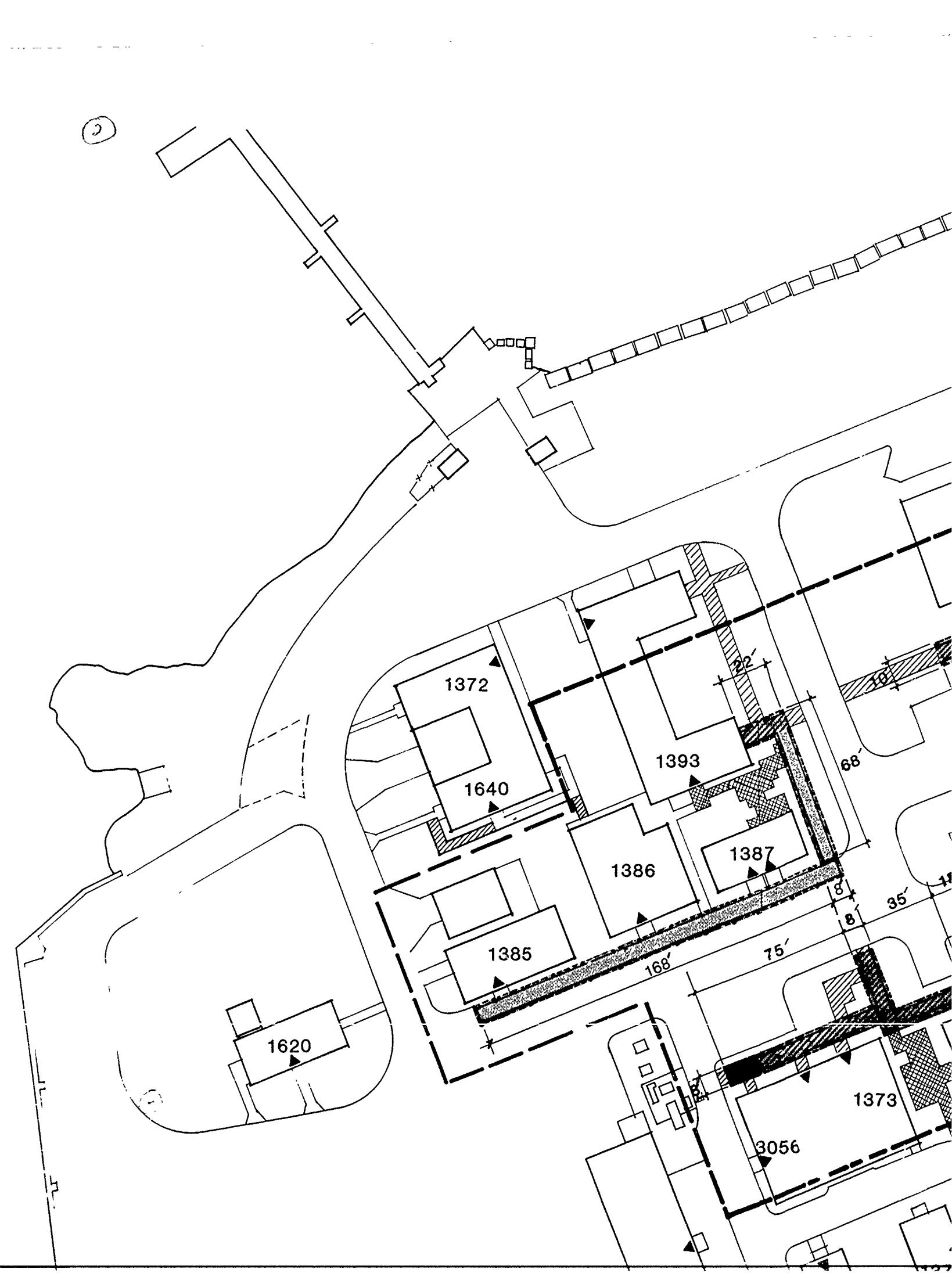
### PHASE ONE

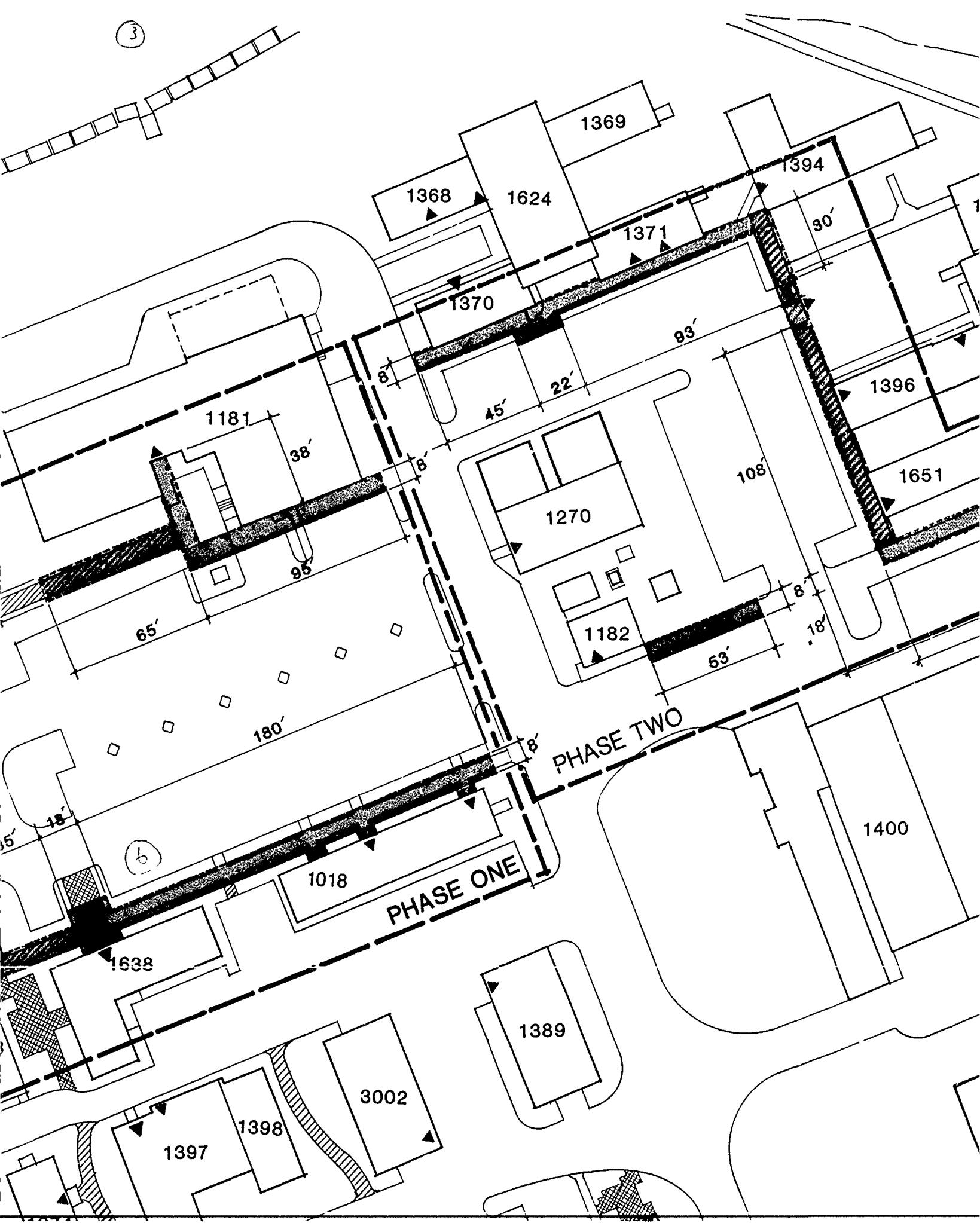
Construction of overhead structure within Main Plaza Area

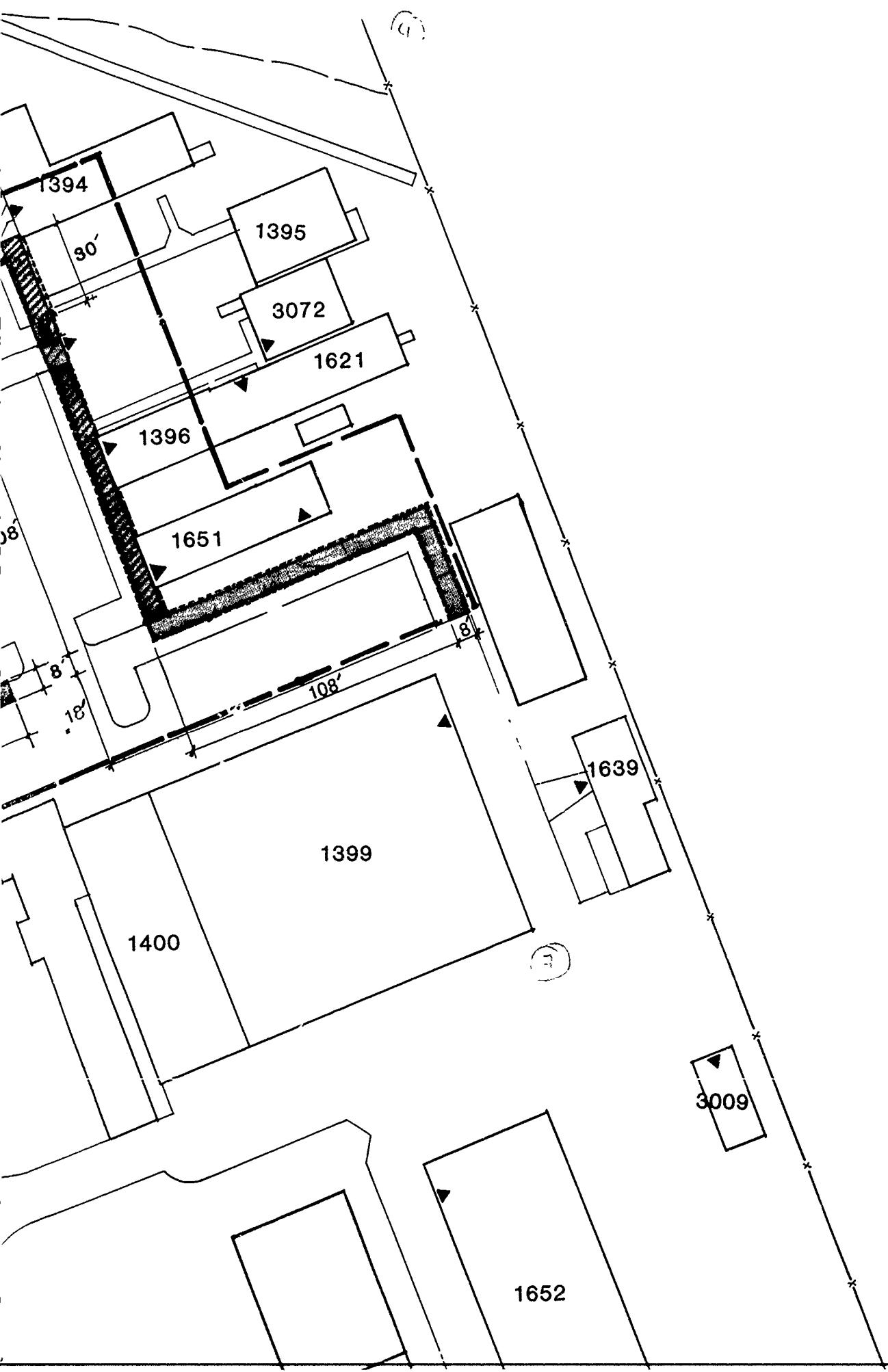
### PHASE TWO

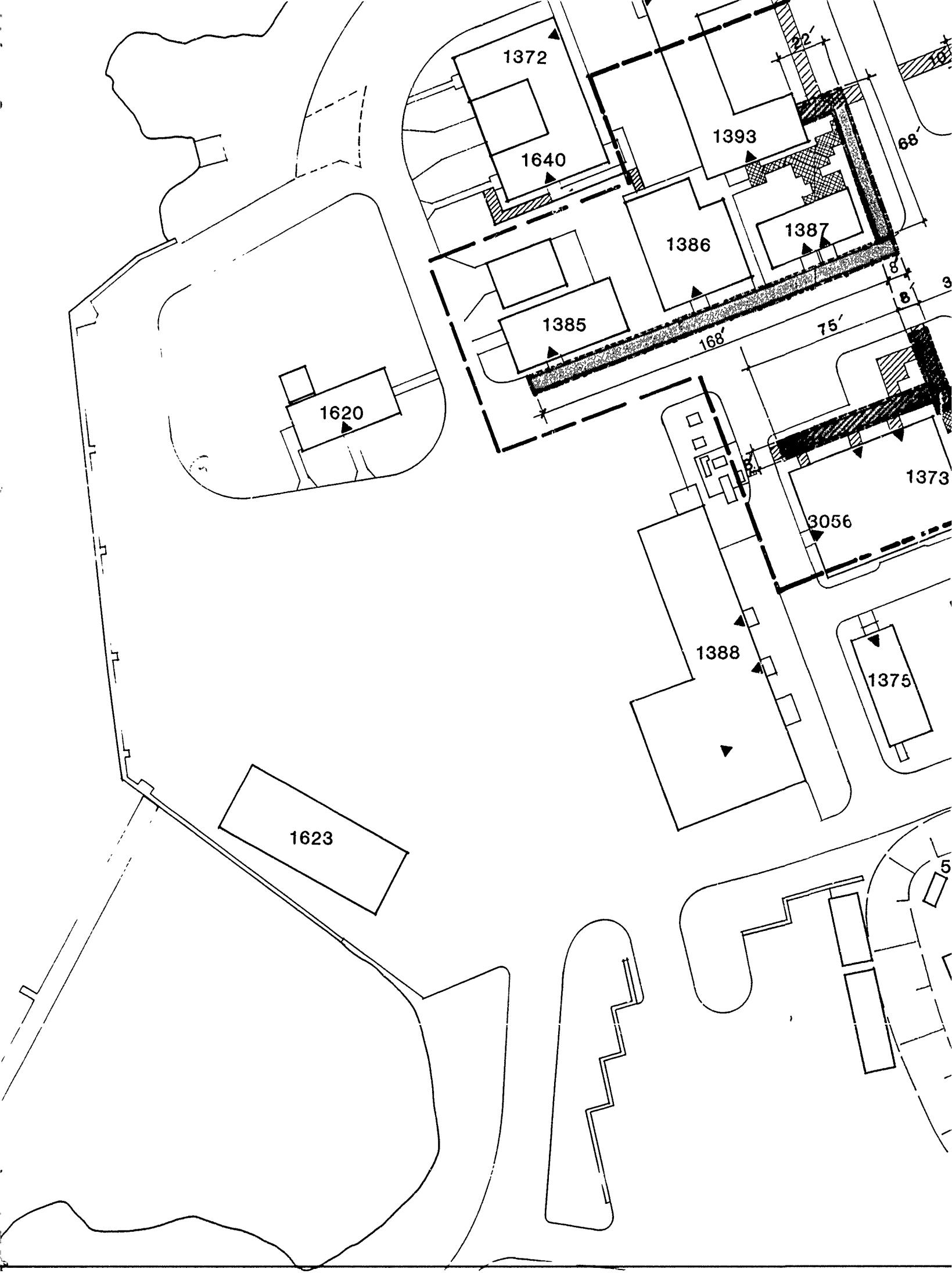
Construction of overhead structure within Advance Systems Area

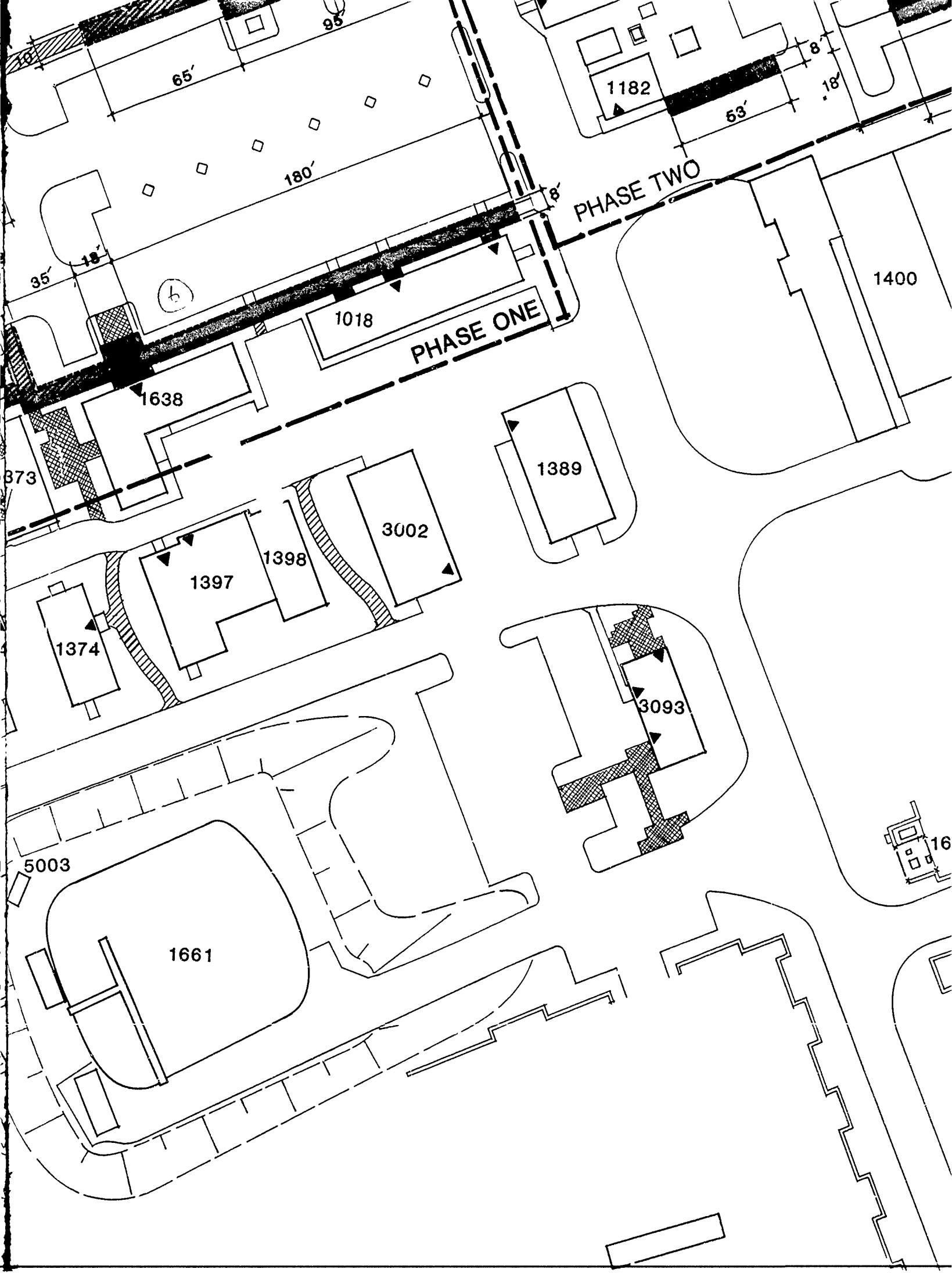
NOTE: All dimensions indicated on this plan are approximate. Verify in field.

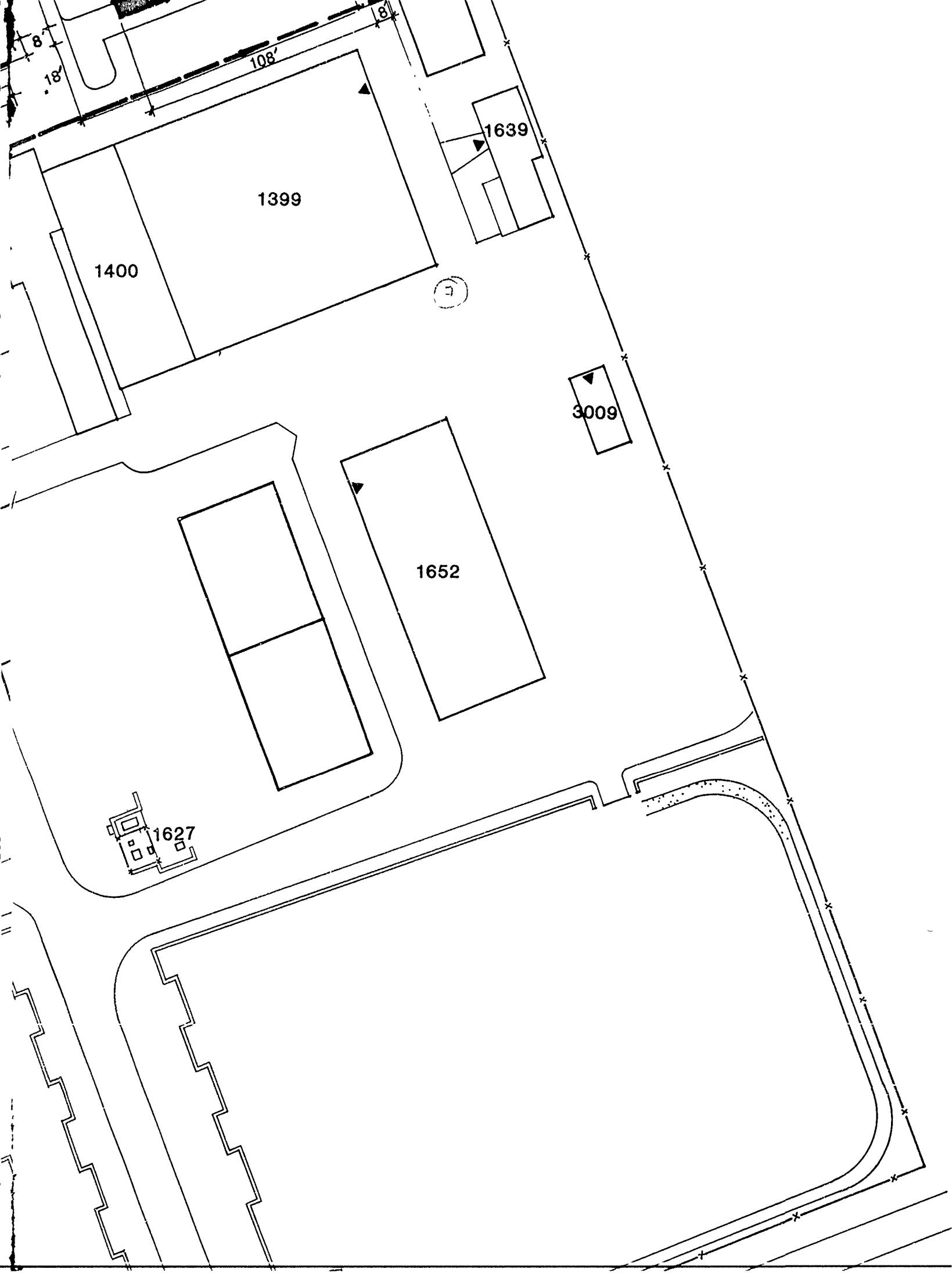




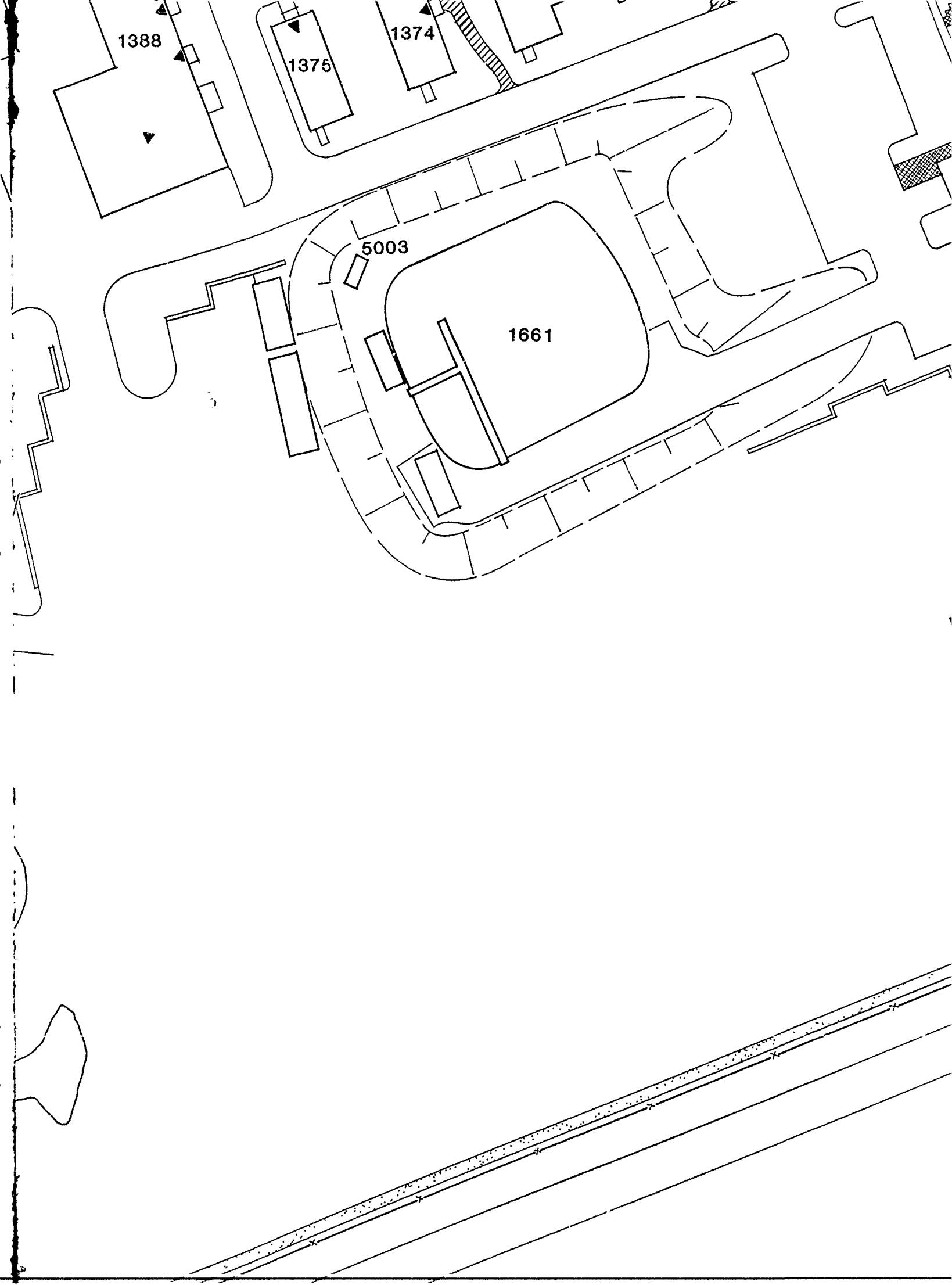


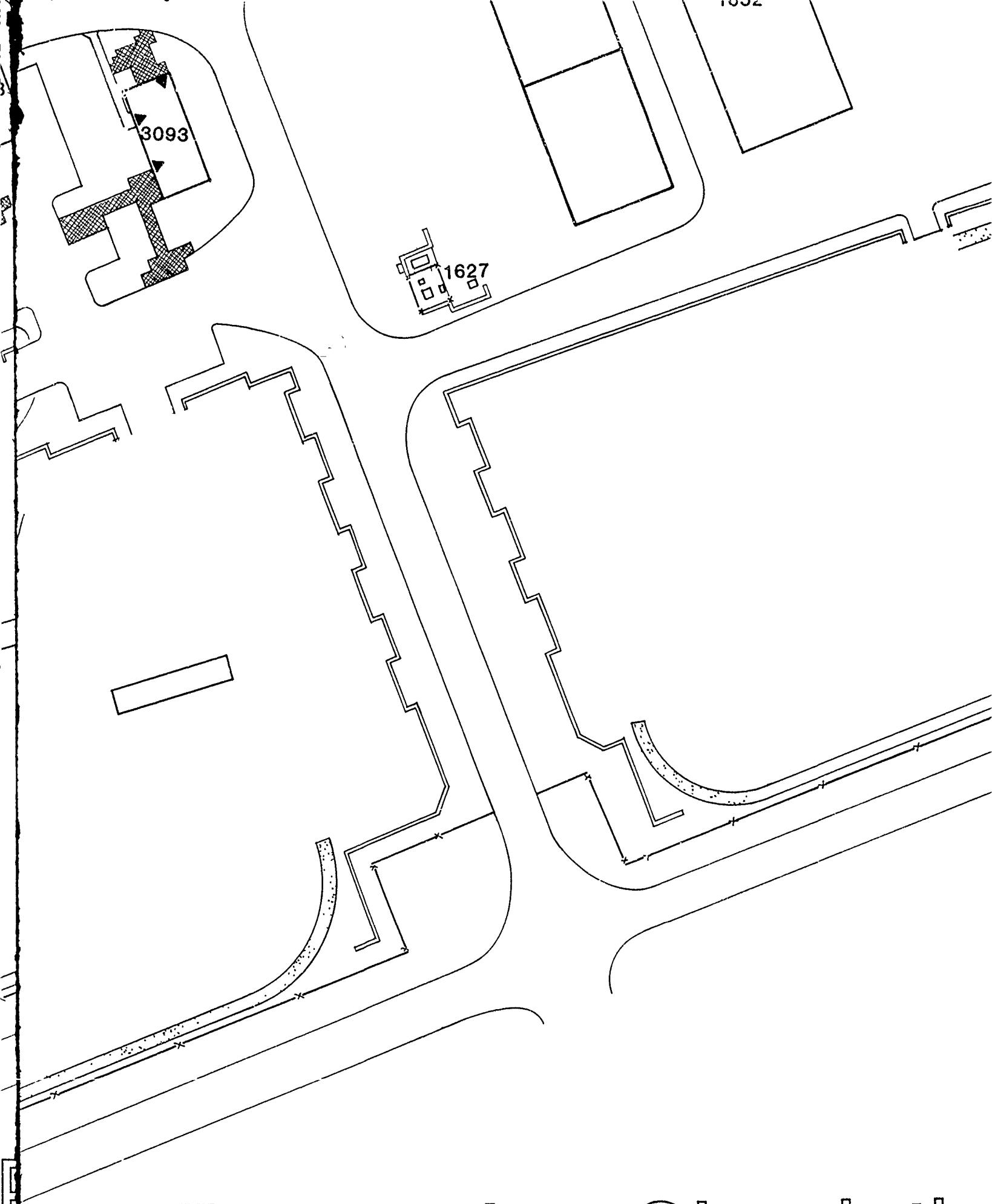




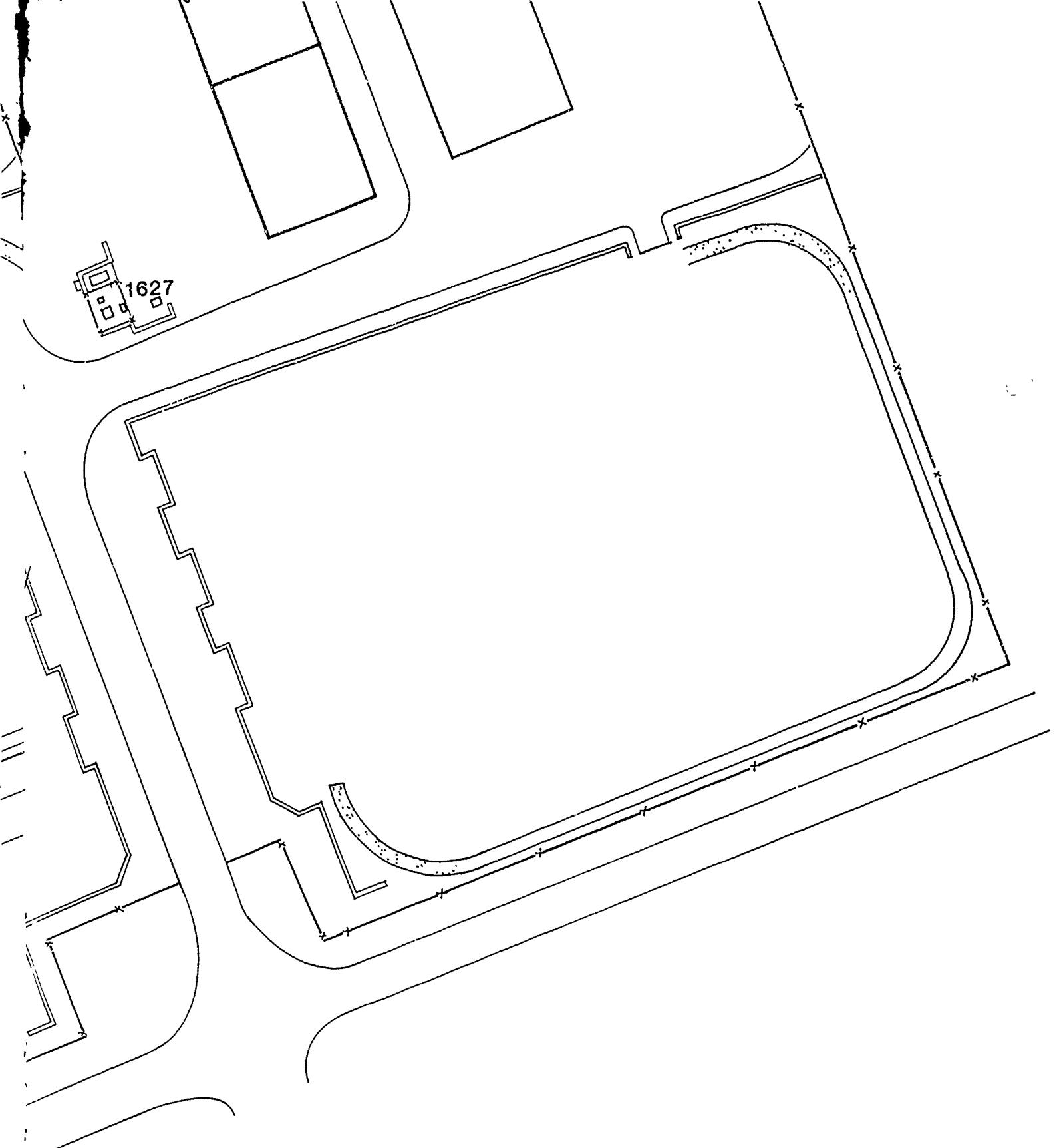






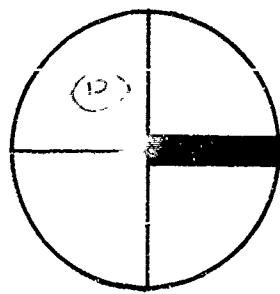
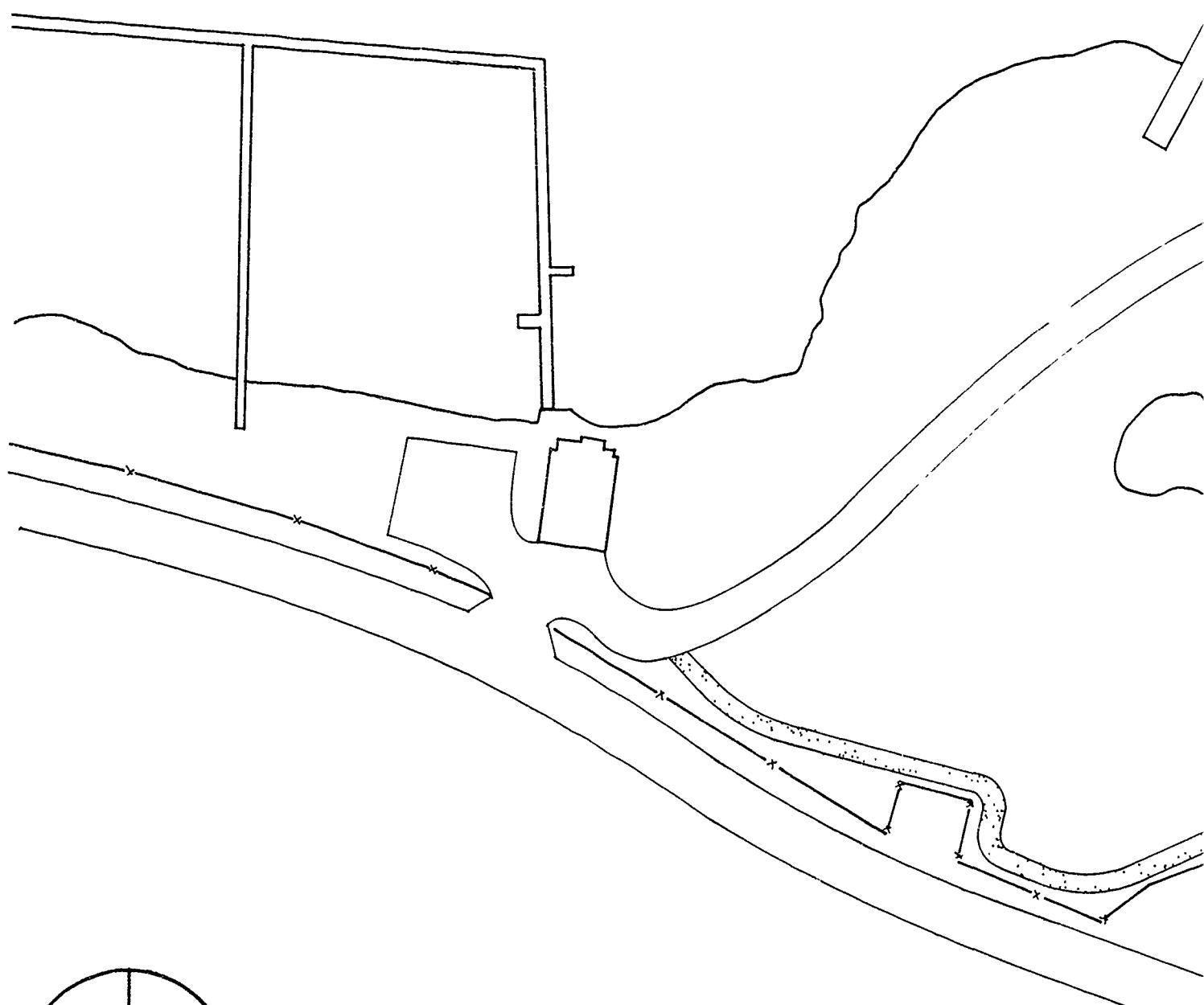


Pedestrian Circulation

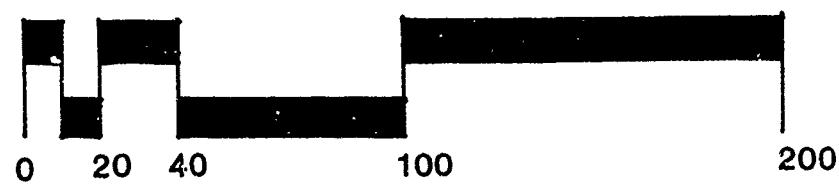


# estrian Circulation Plan

13



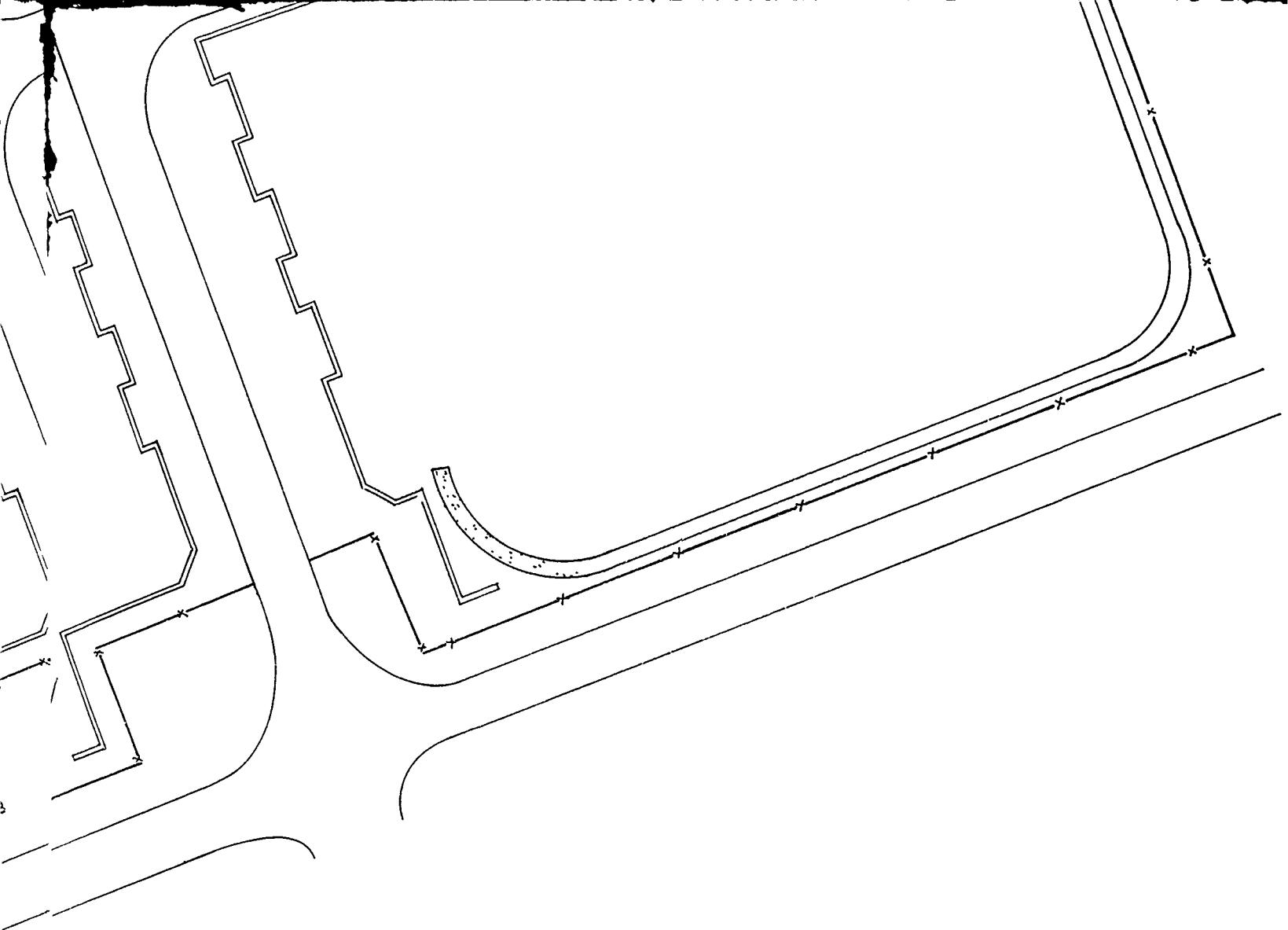
NORTH



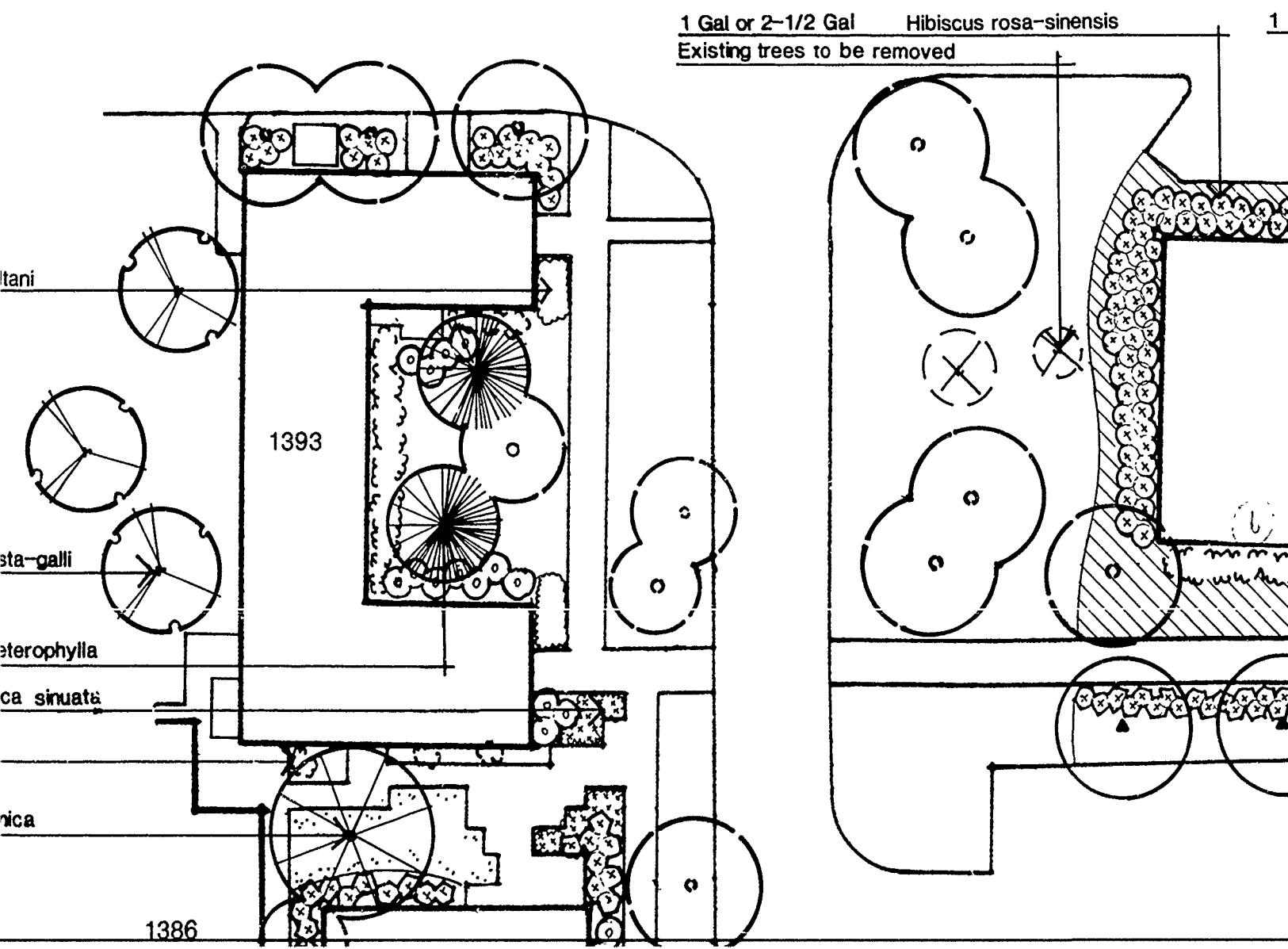
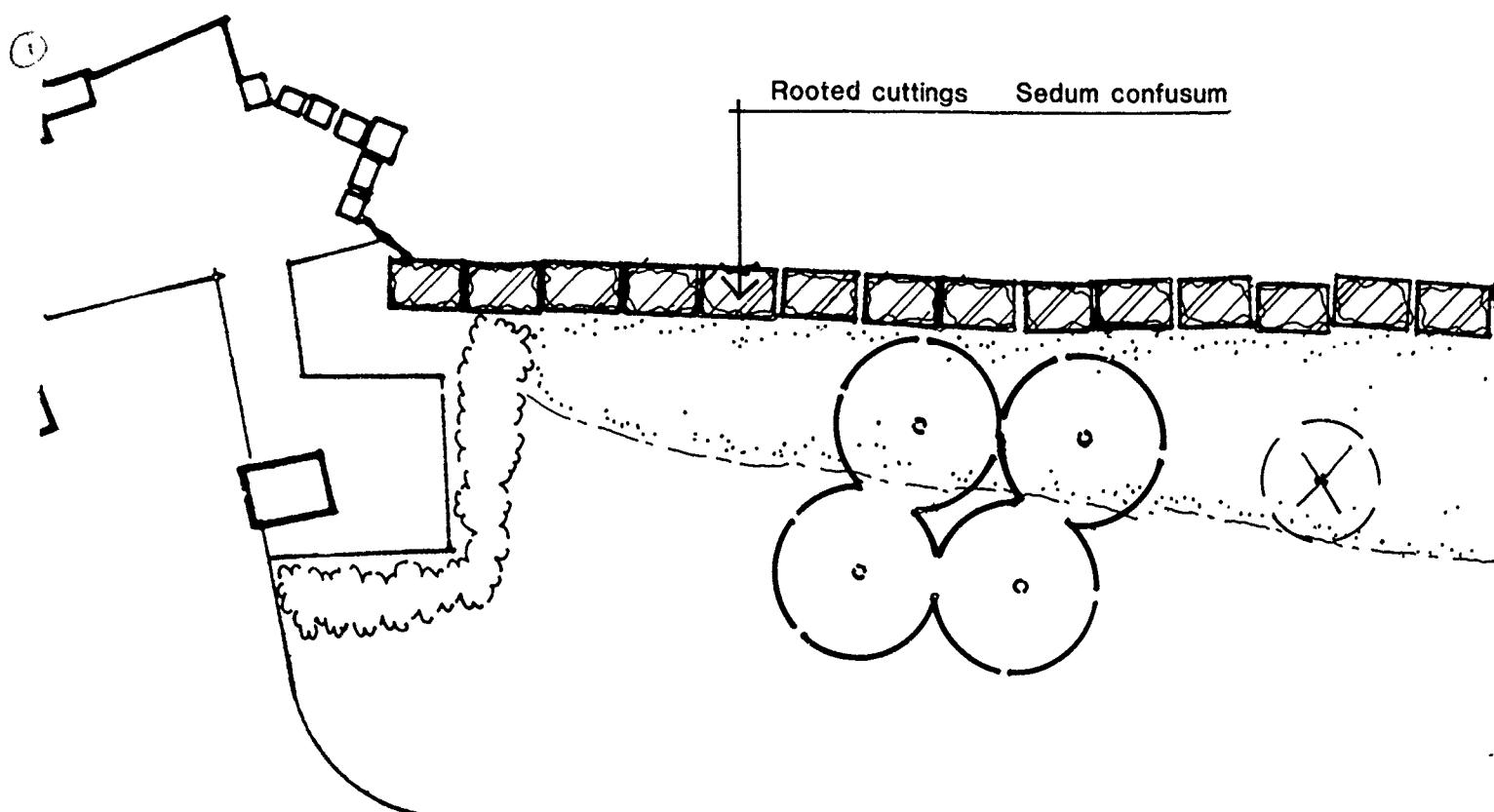


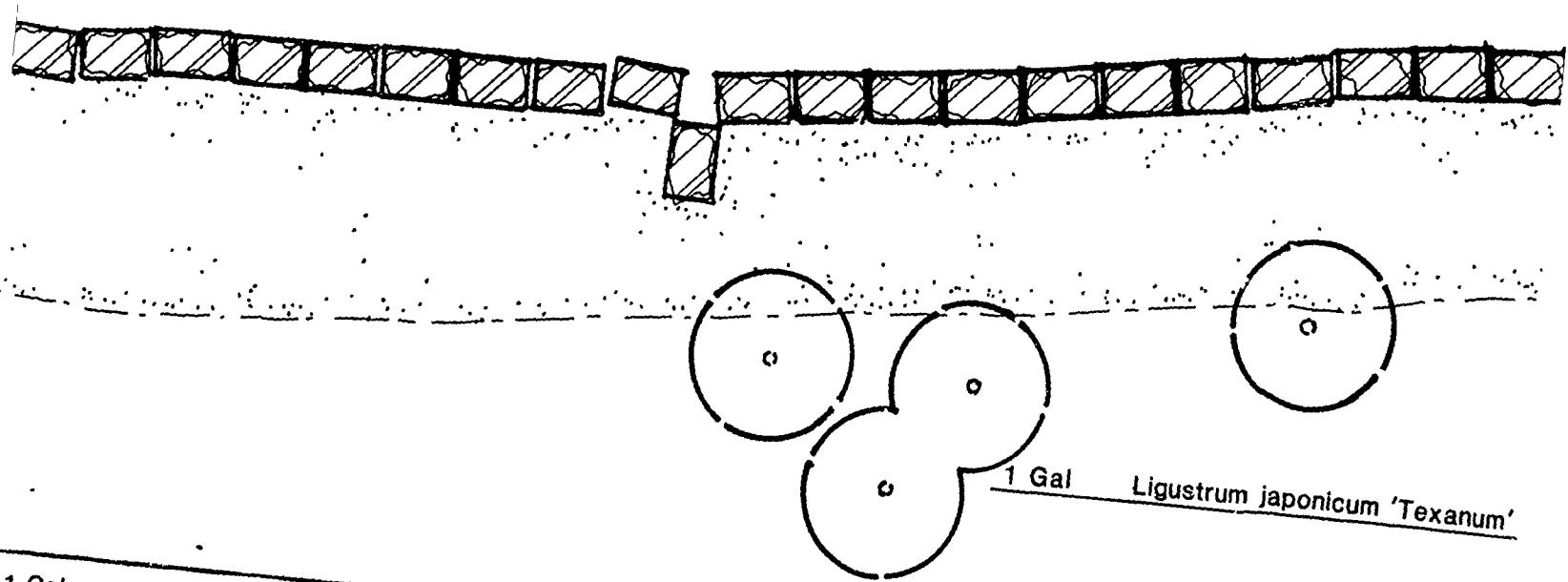
1661

Pedo  
Naval

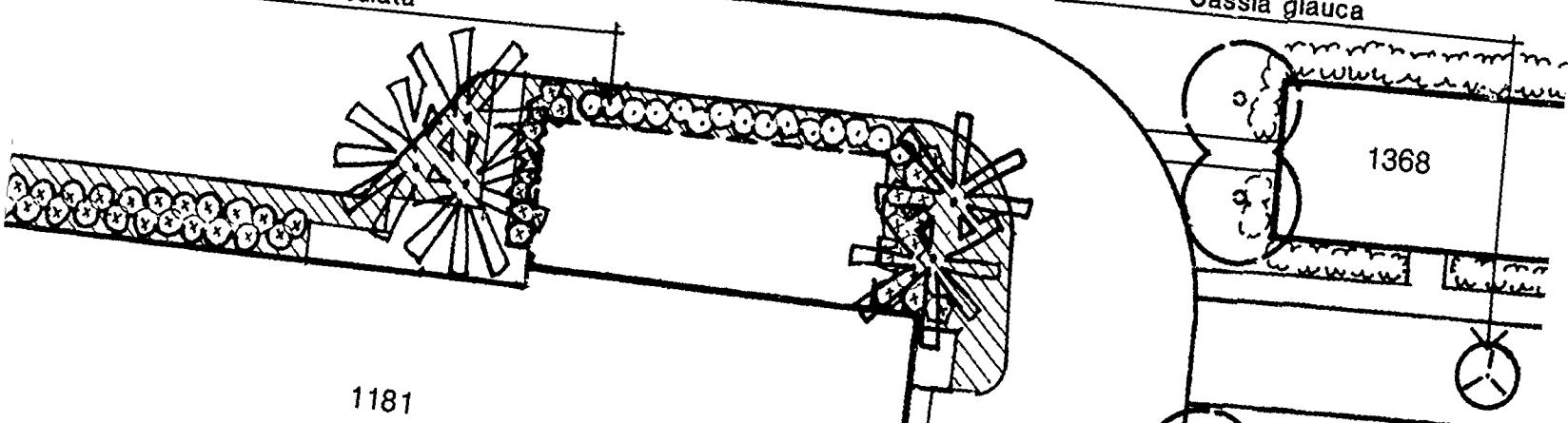


**Pedestrian Circulation Plan**  
**Ocean Systems Center**  
**Hawaii Laboratory**



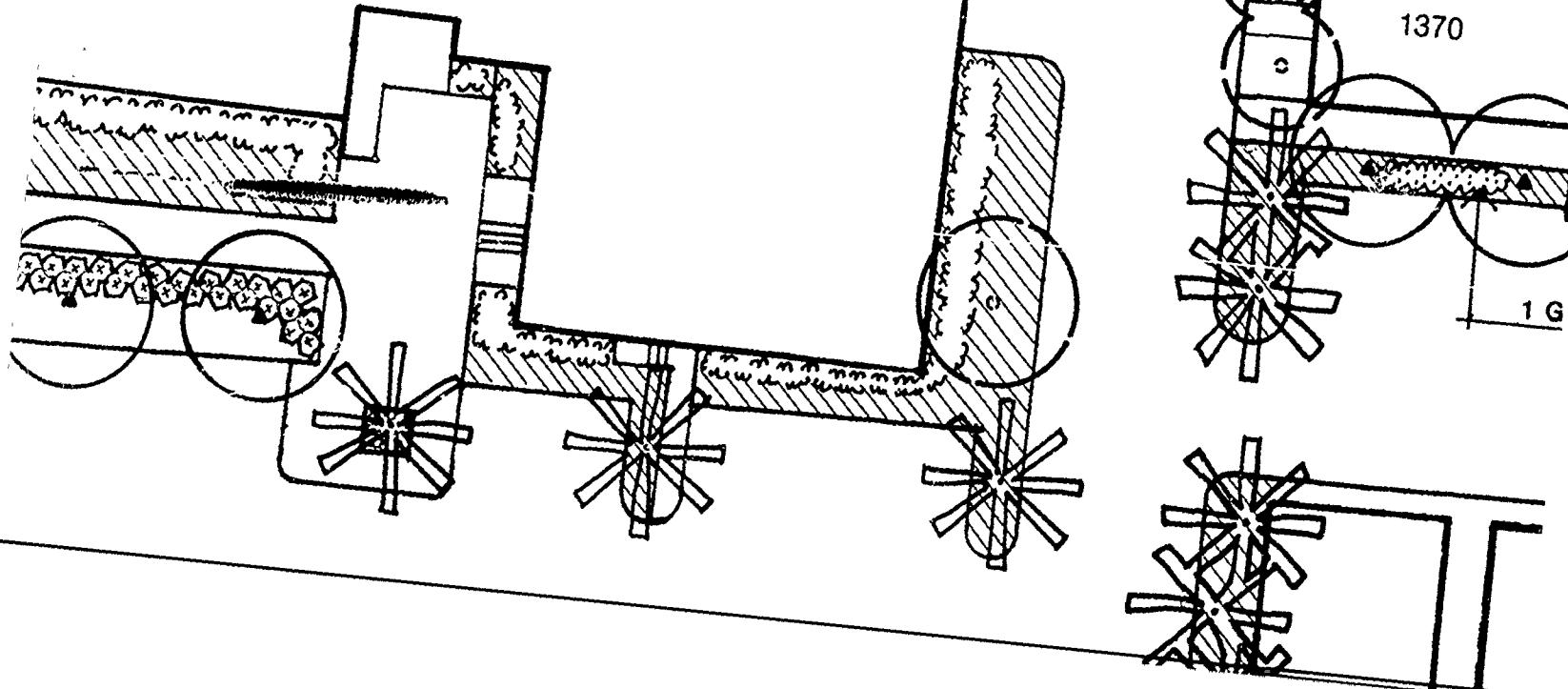


1 Gal *Ligustrum japonicum 'Texanum'*



1 Gal *Murraya paniculata*

5 Gal *Cassia glauca*

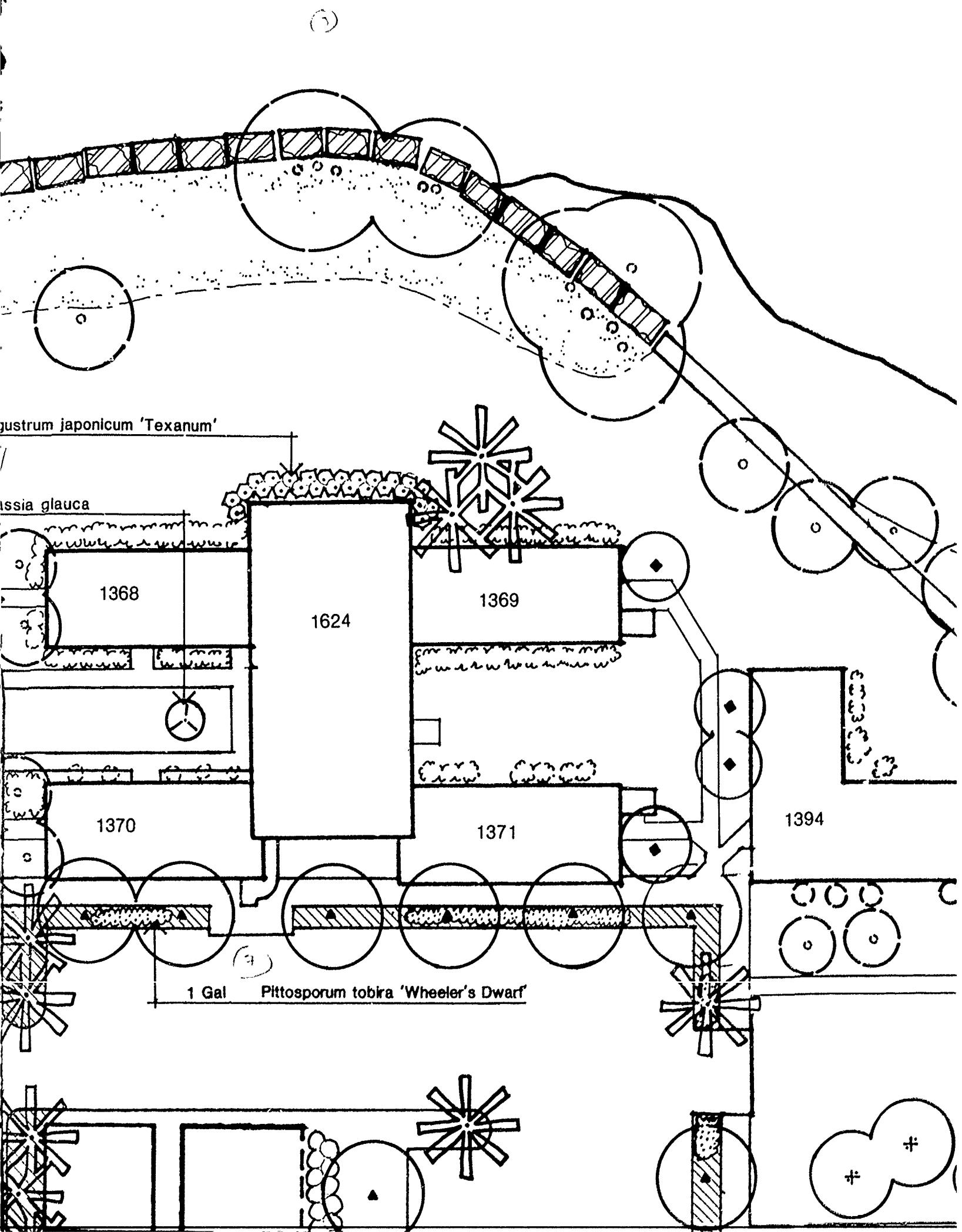


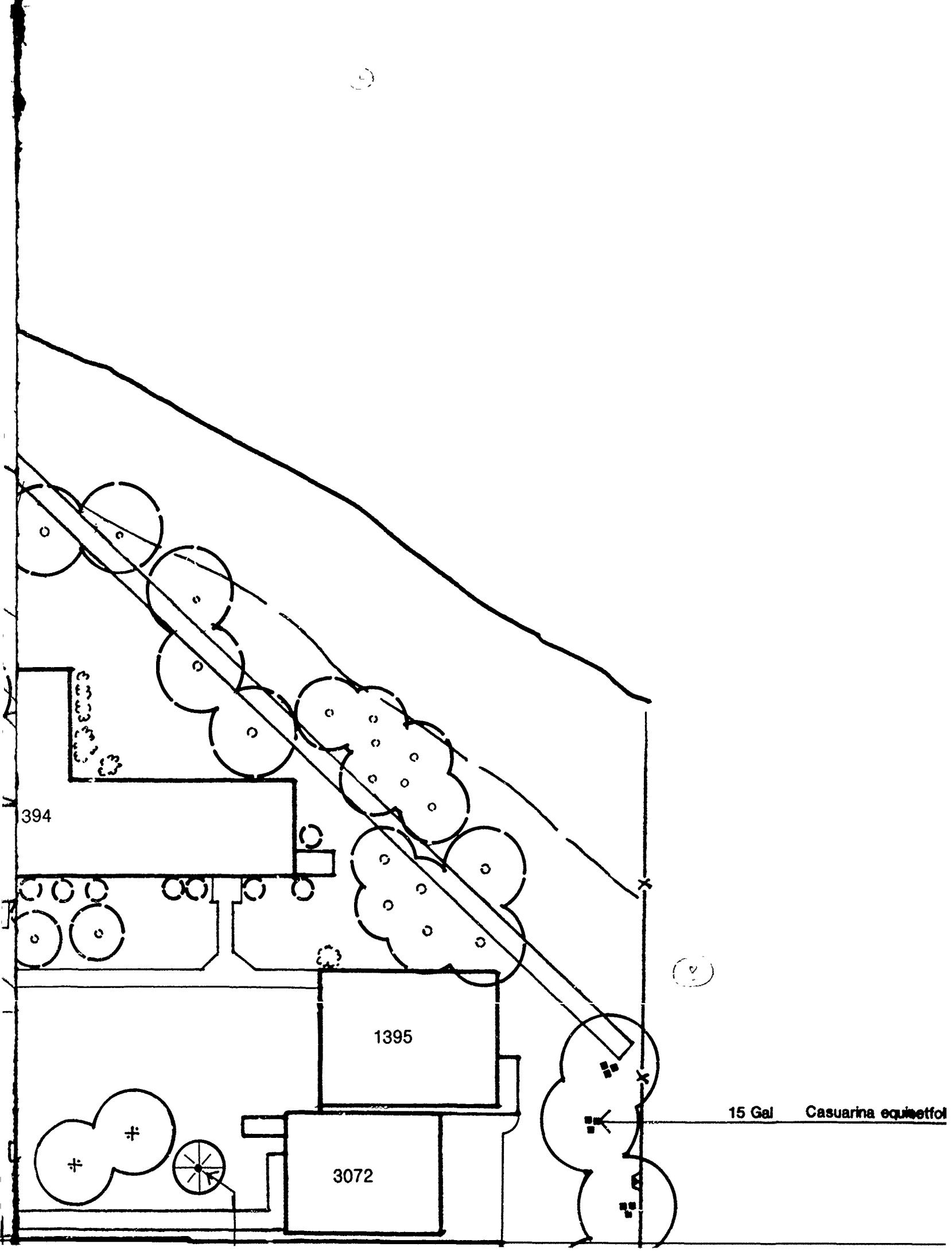
1181

1368

1370

1 G





1 Gal. Impatiens sultani

(5)

25 Gal Erythrina crista-galli

15 Gal Araucaria heterophylla

4" pots Dimorphotheca sinuata

Existing shrubs to remain

15 Gal Cassia javanica

1393

1386

1387

5 Gal Codiaeum variegatum

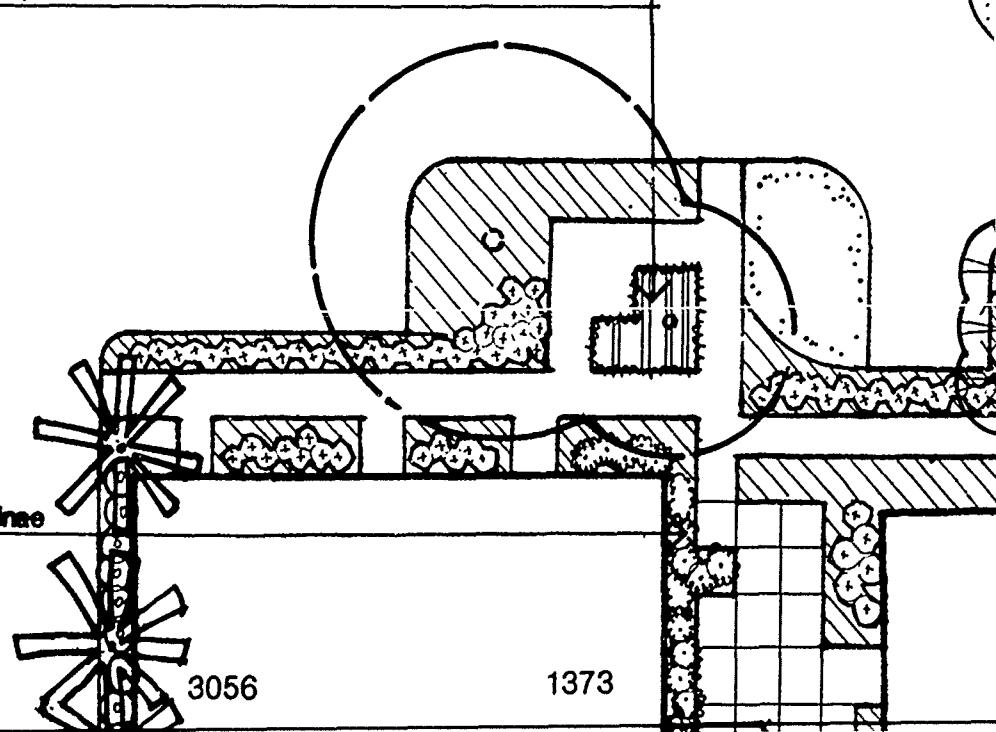
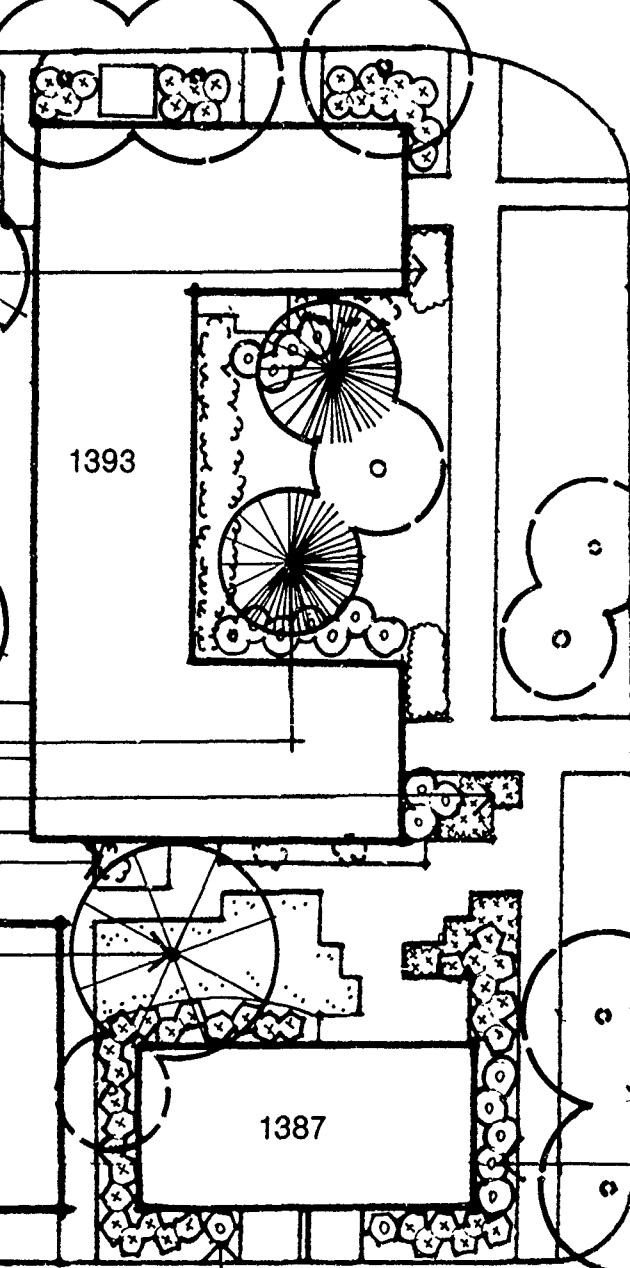
Rooted sprigs Ophiopogon japonicus

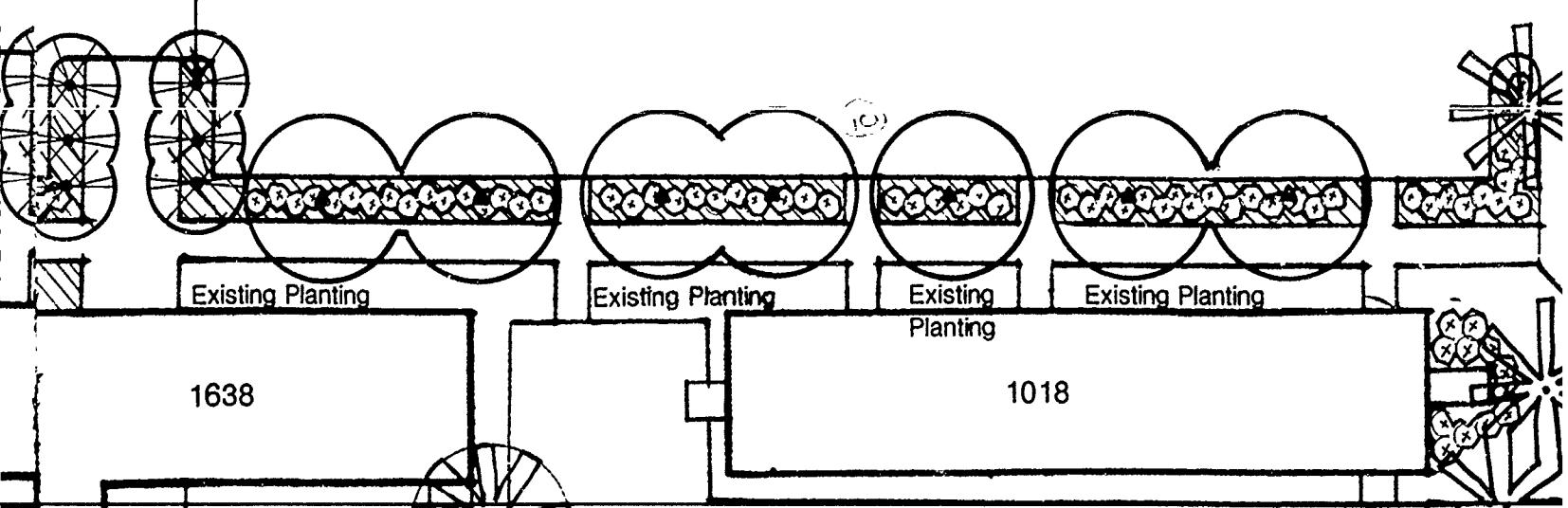
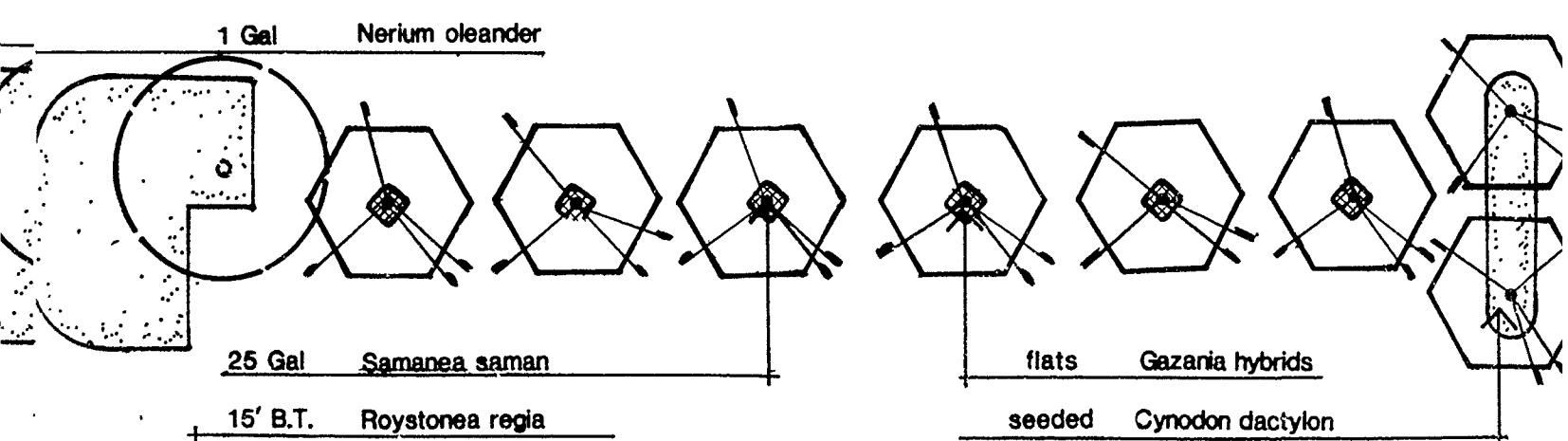
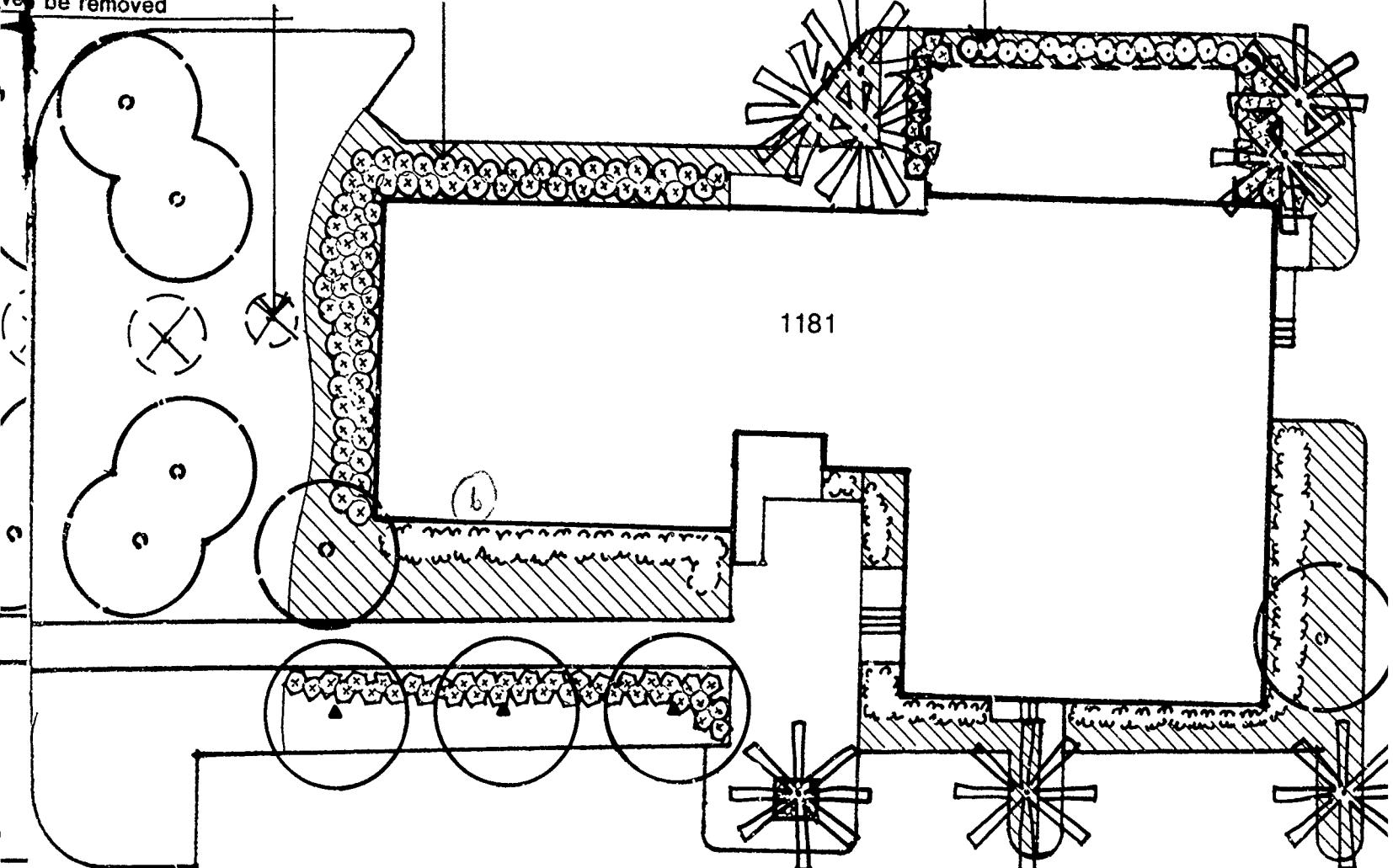
2-1/2 Gal Strelitzia reginae

(a)

3056

1373





1368

1624

1369

1370

1371

1394

1 Gal

*Pittosporum tobira 'Wheeler's Dwarf'*

1270

1182

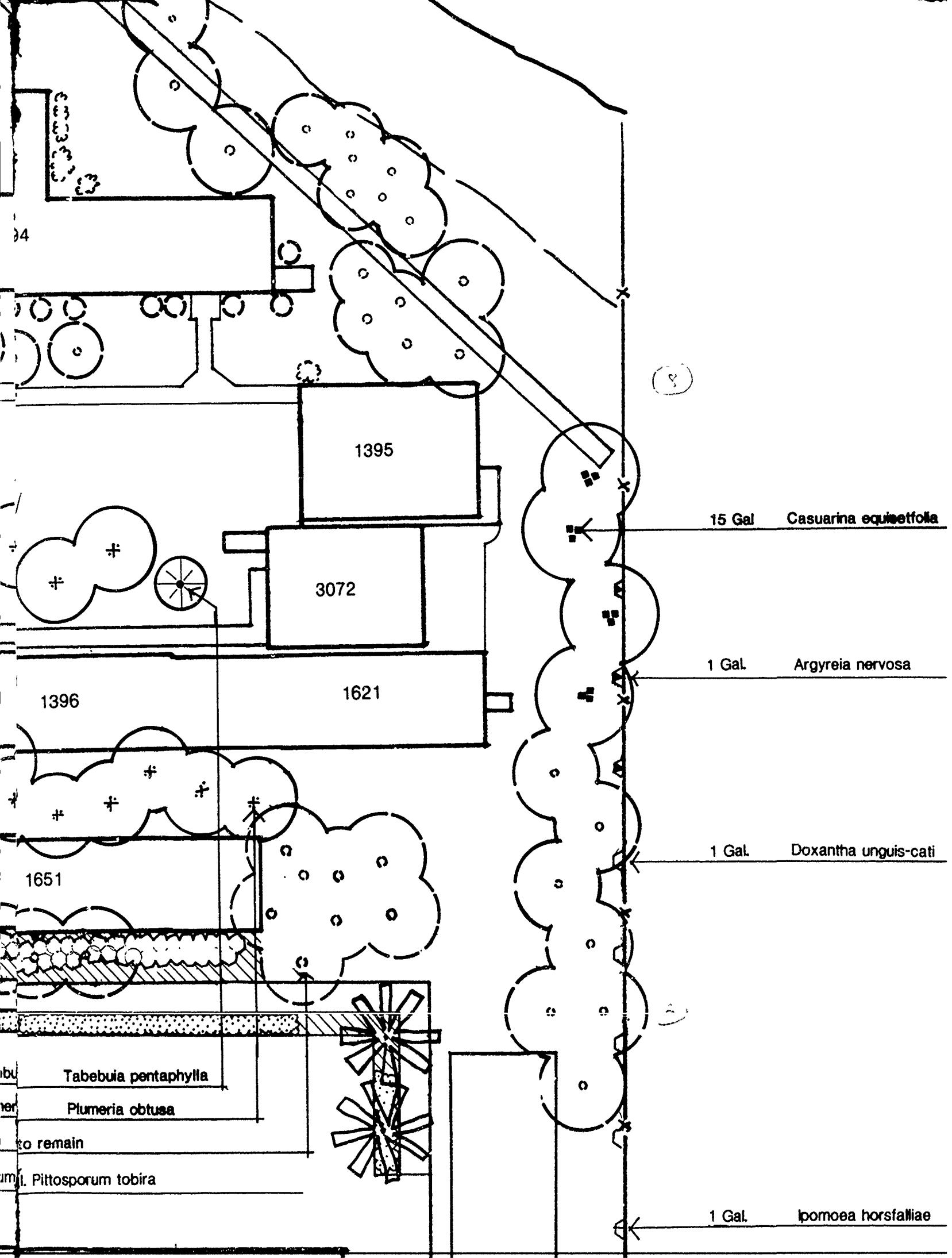
25 Gal *Delonix regia*15 Gal. *Calophyllum inophillum*1 Gal *Ixora chinensis*Rooted cuttings *Wedelia trilobata*15' B.T. *Cocos nucifera*5 Gal *Gardenia taitensis*

25 Gal

25 Gal

Existing tree to r

2-1/2 to 5 Gal. Pi



5 Gal

*Codiaeum variegatum*

Rooted sprigs

*Ophiopogon japonicus*

2-1/2 Gal

*Strelitzia reginae*

3056

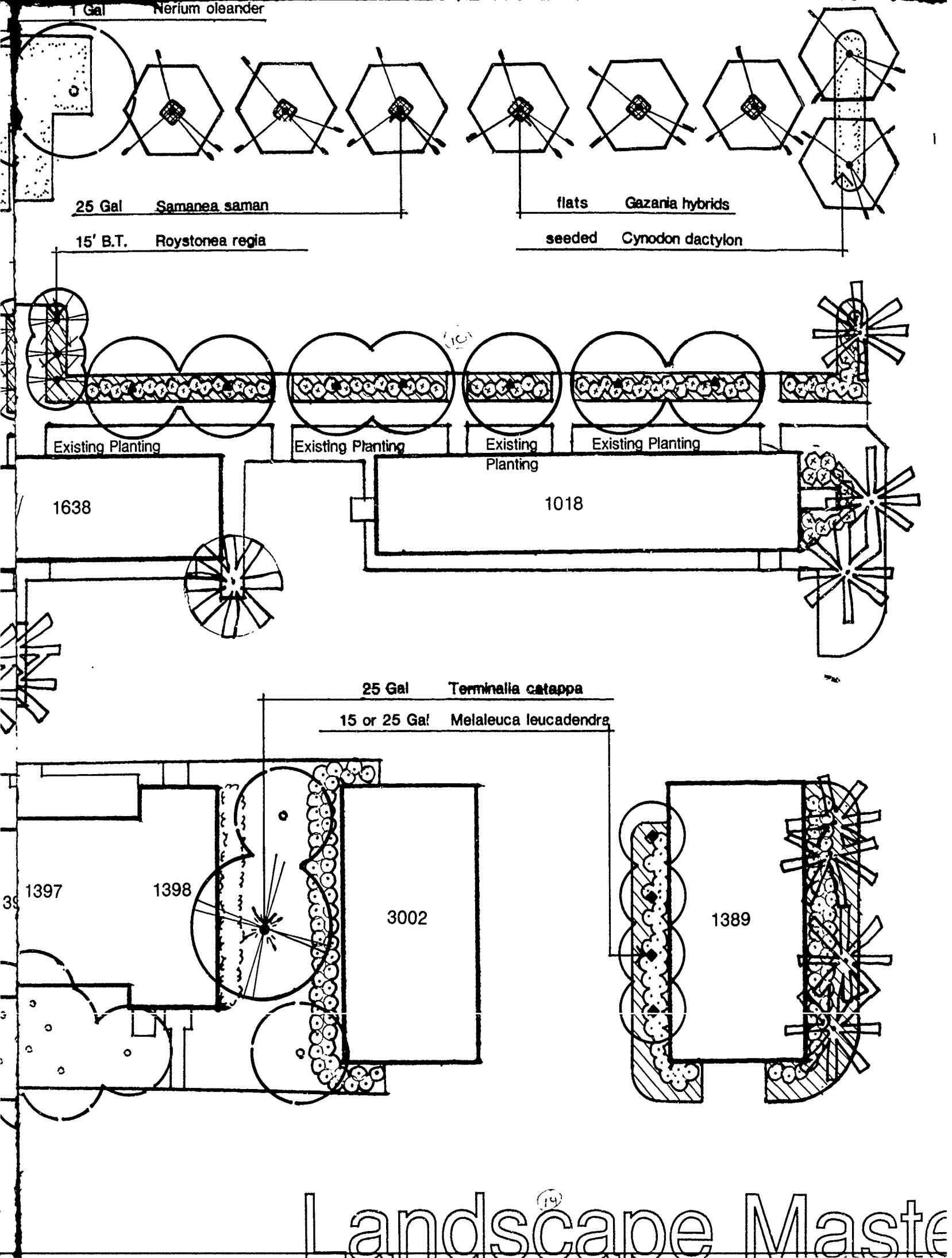
1373

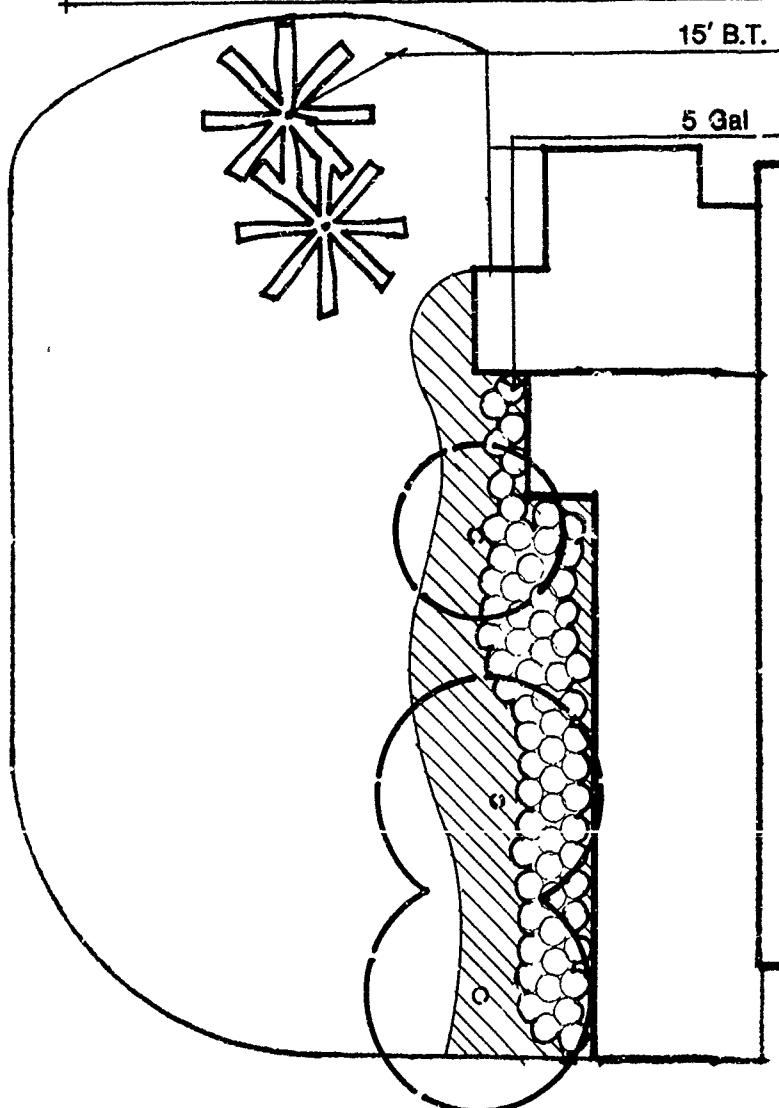
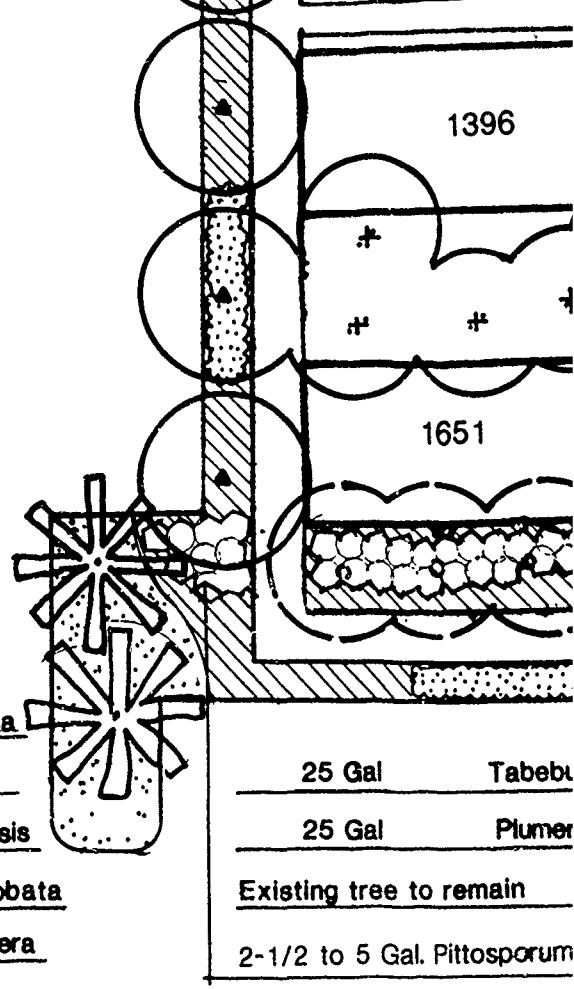
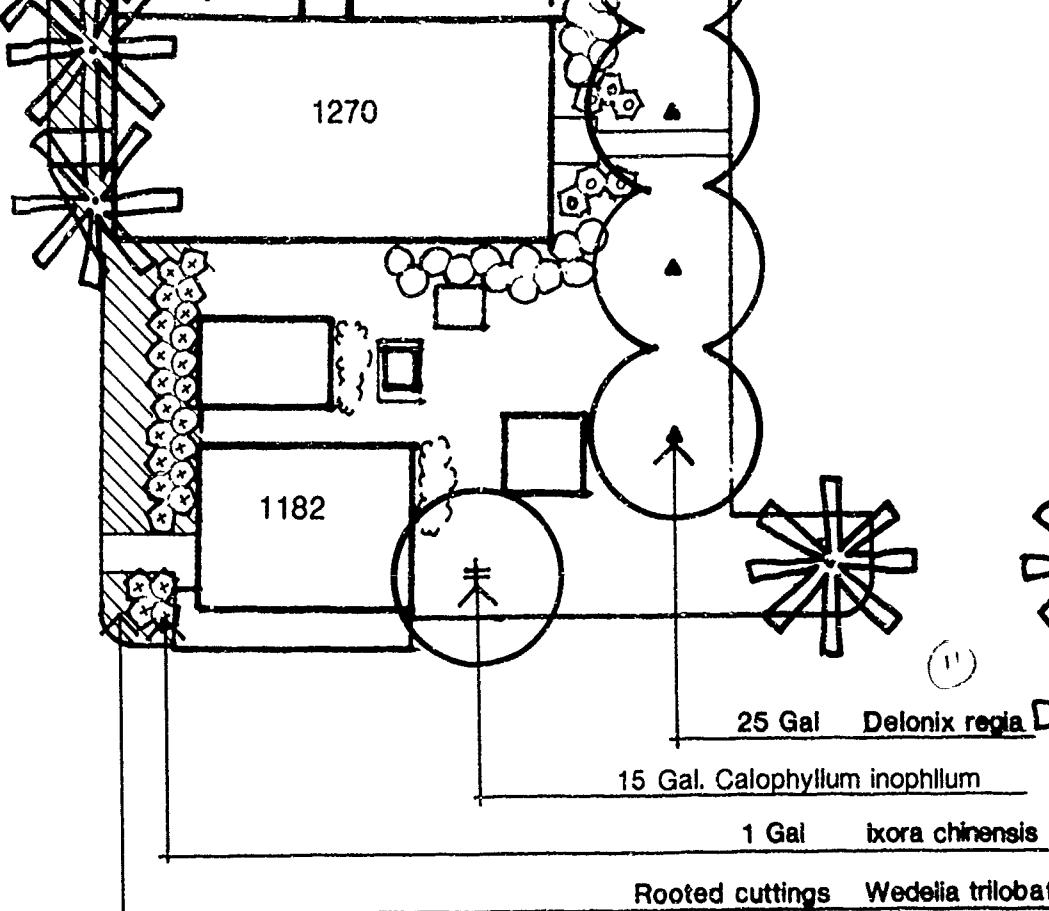
25 Gal

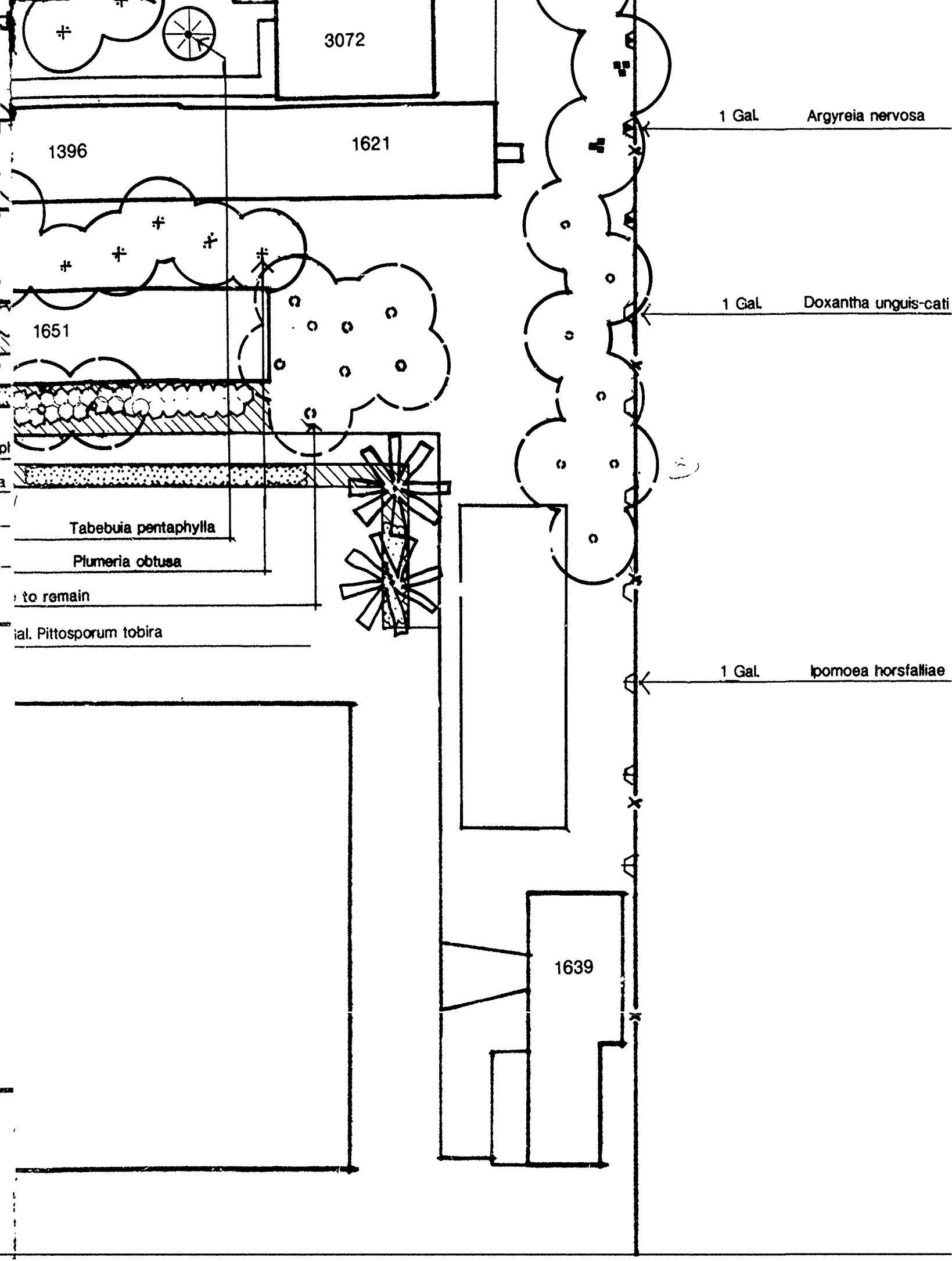
*Citharexylum spinosum*

1375

1374

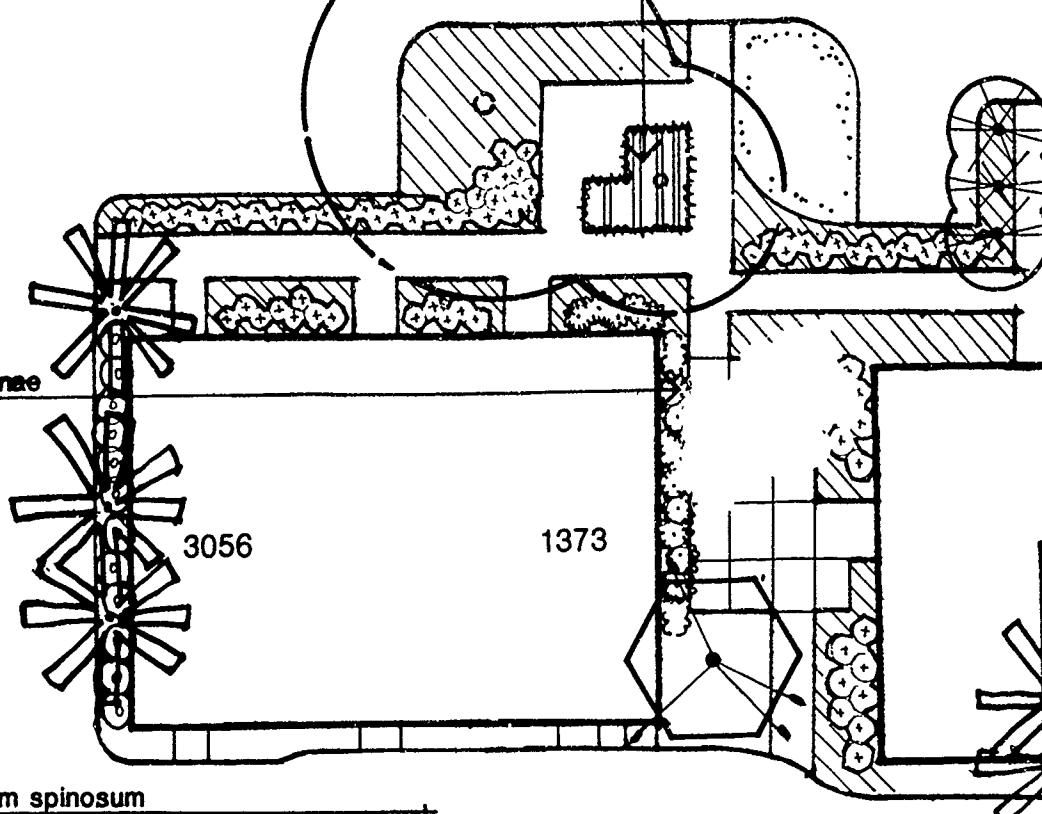






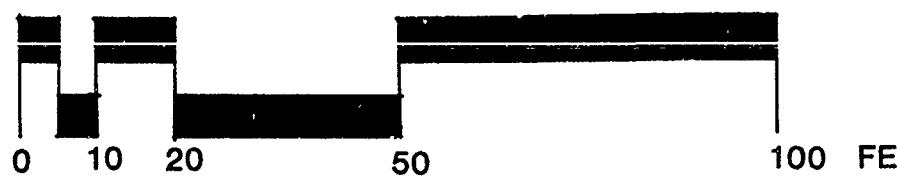
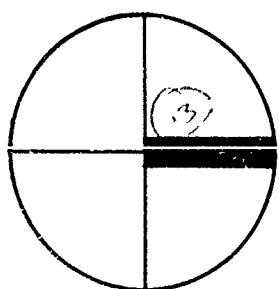
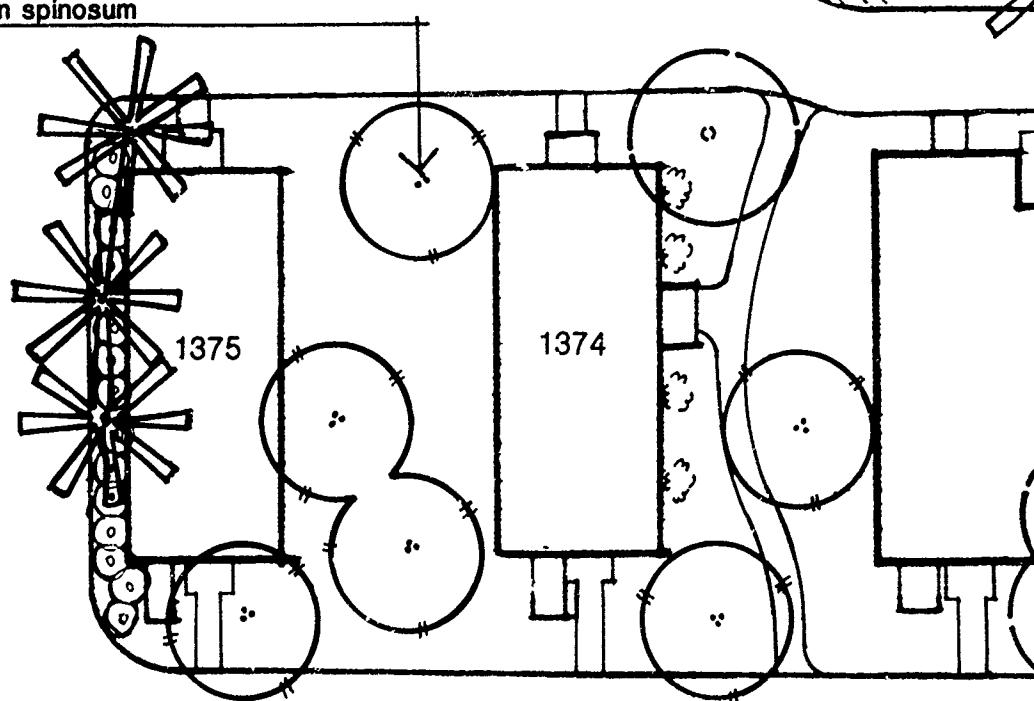
2-1/2 Gal

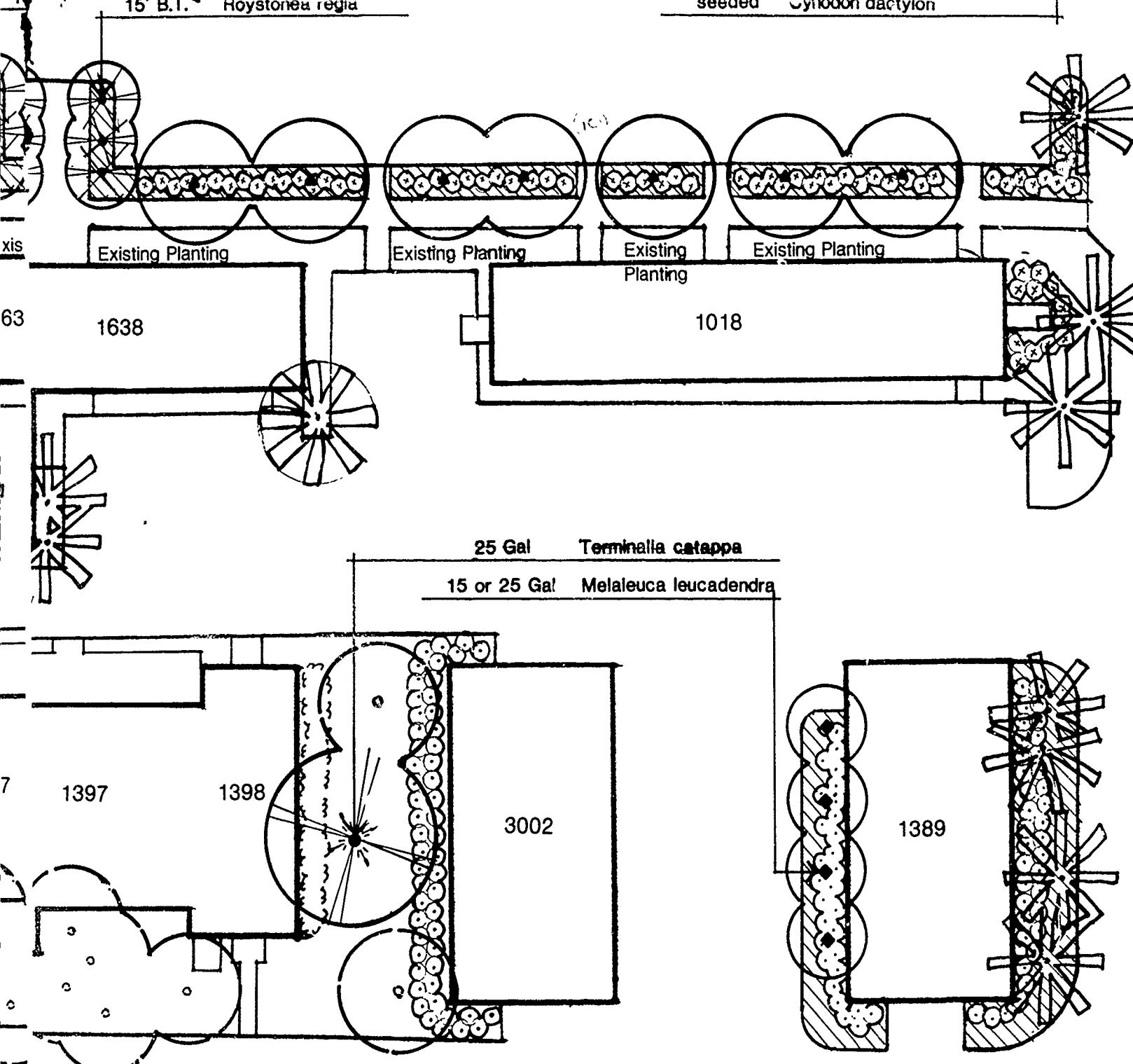
*Strelizia reginae*



25 Gal

*Citharexylum spinosum*

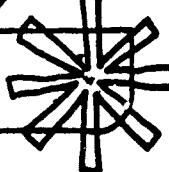




Landscape Mas

1182

†



①

25 Gal *Delonix regia*15 Gal. *Calophyllum inophillum*1 Gal *Ixora chinensis*Rooted cuttings *Wedelia trilobata*15' B.T. *Cocos nucifera*

25 Gal

Tabebuia p

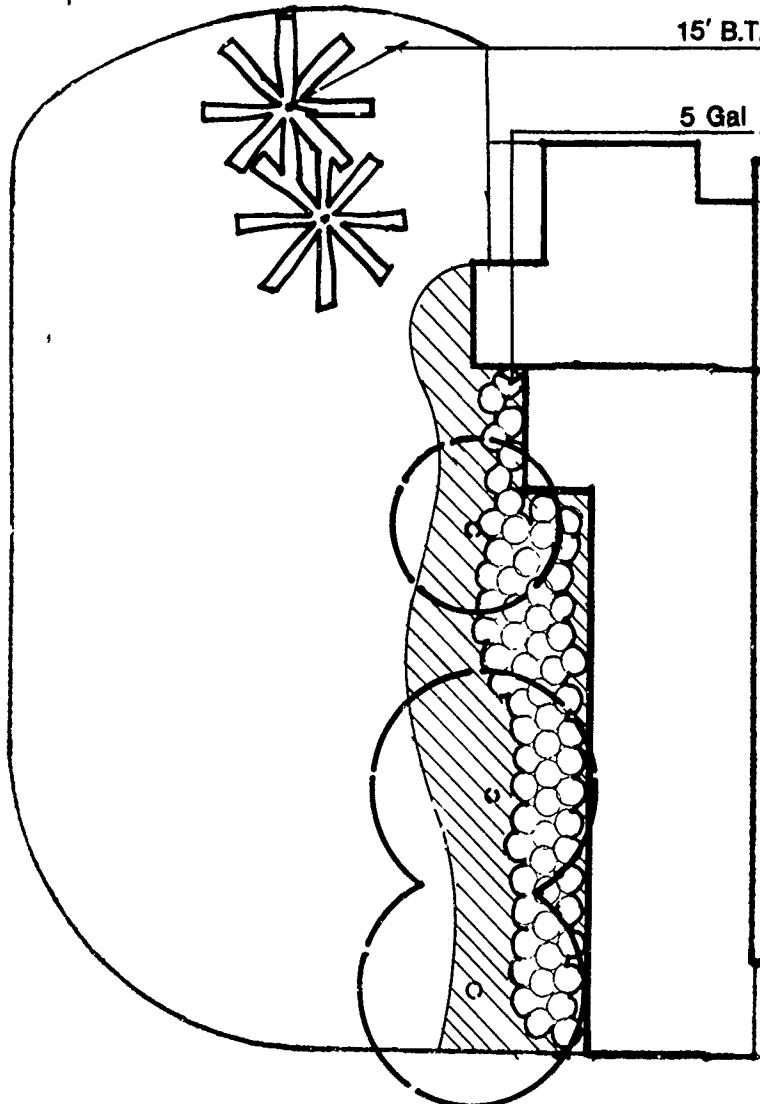
25 Gal

Plumeria c

Existing tree to remain

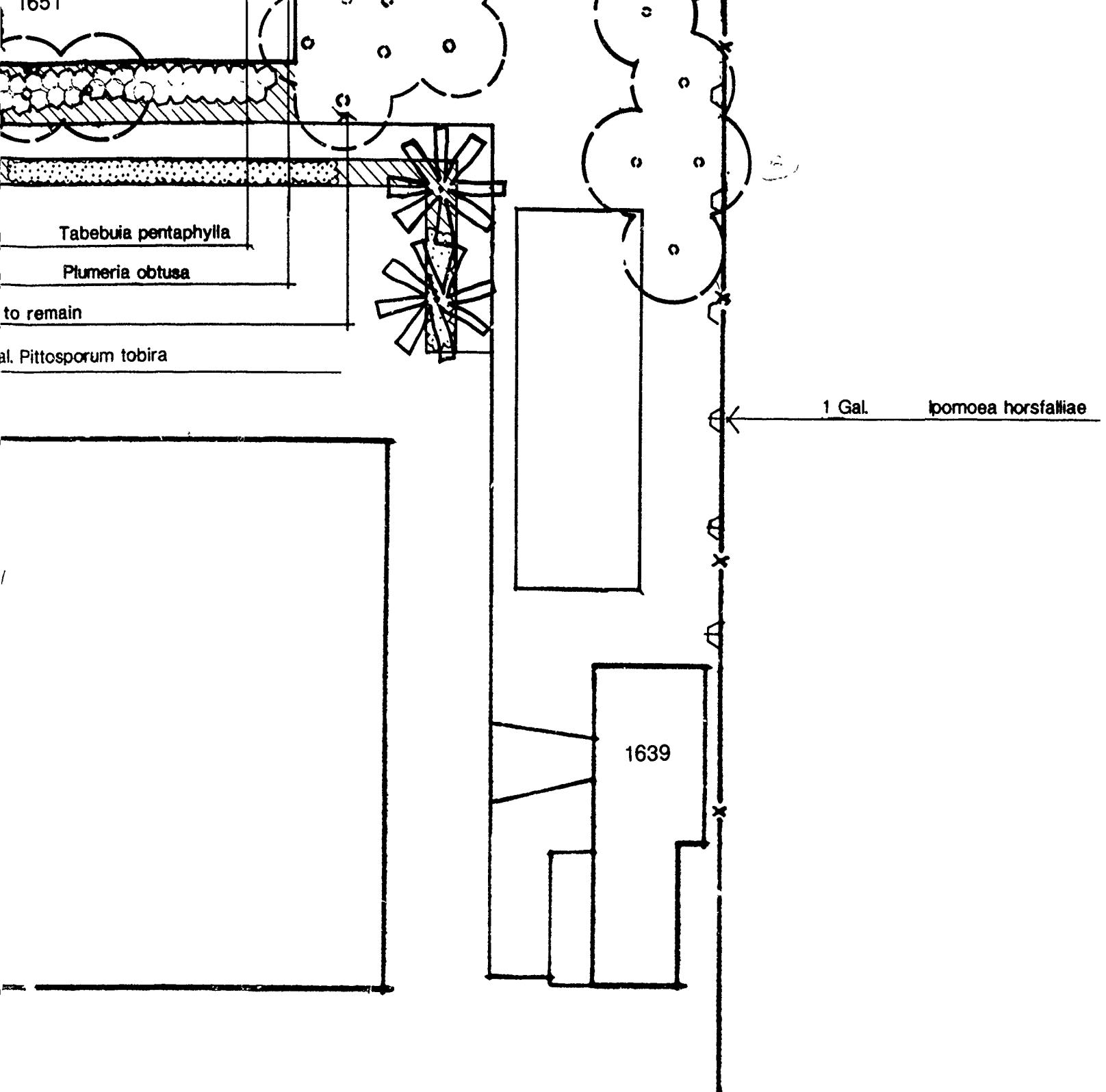
2-1/2 to 5 Gal. *Pittosporum* tot5 Gal *Gardenia taitensis*

1399



er Plan

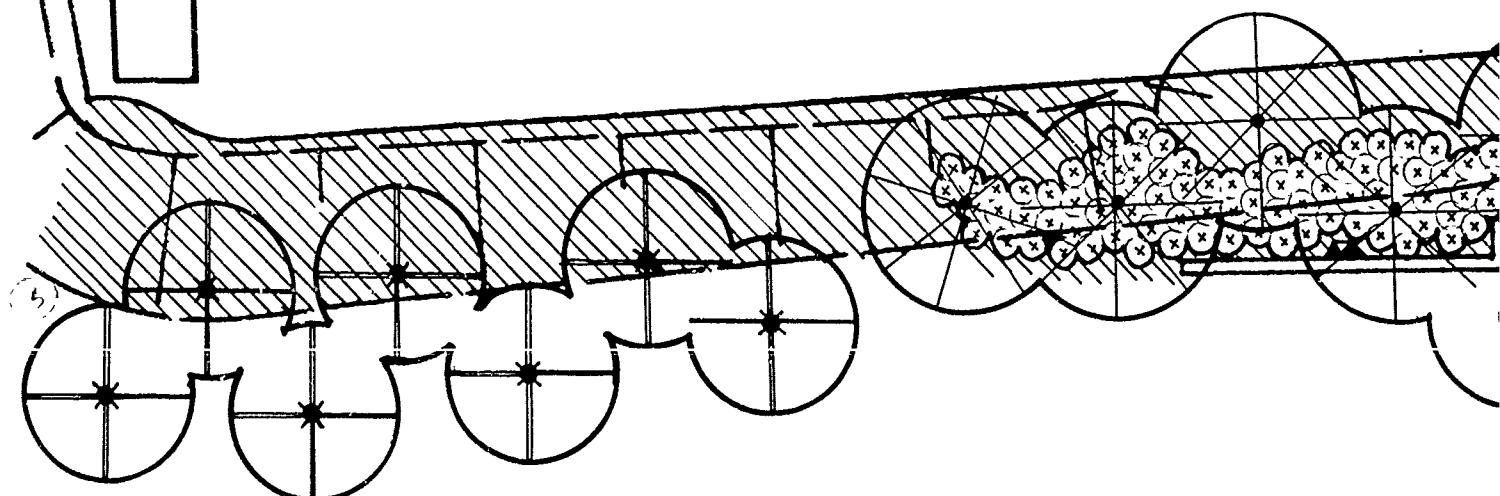
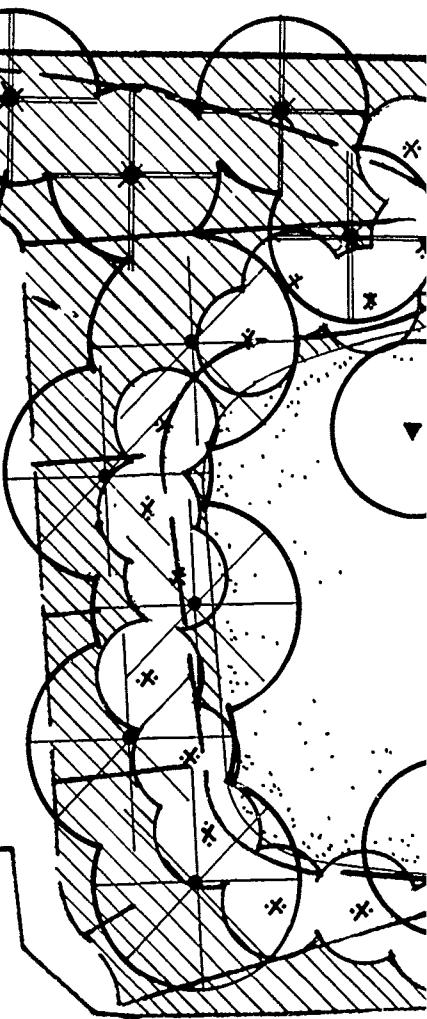
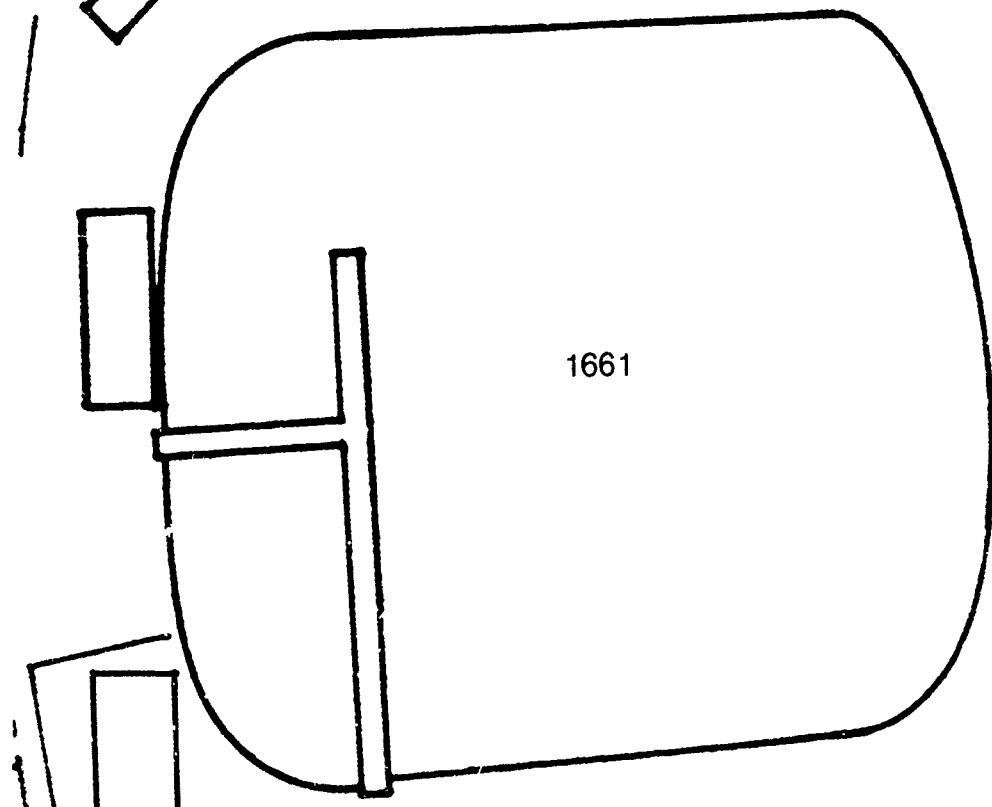
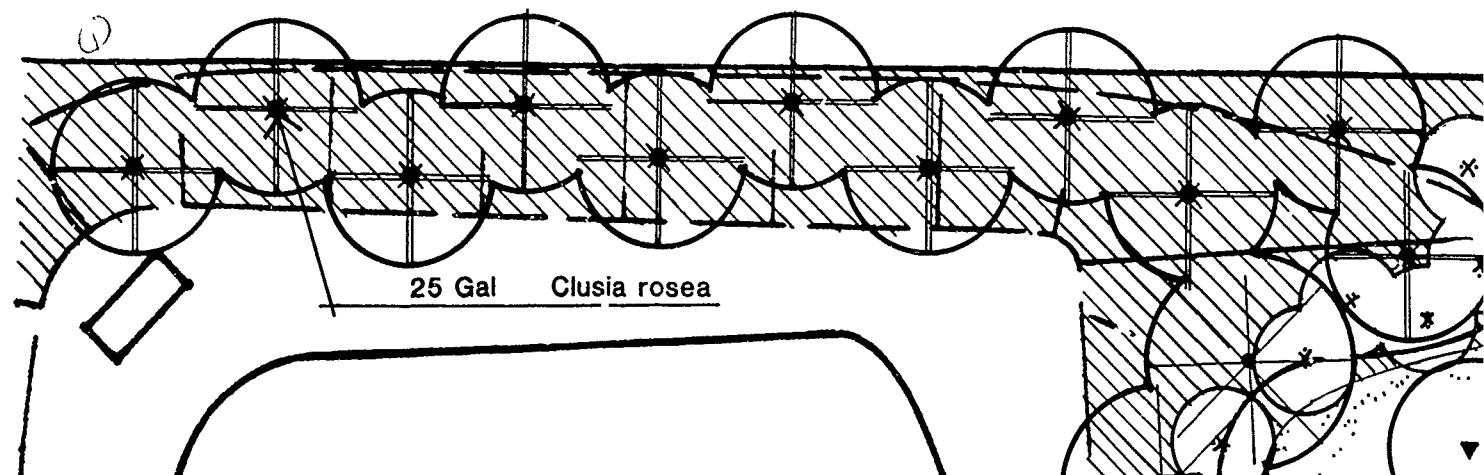
Naval Oc

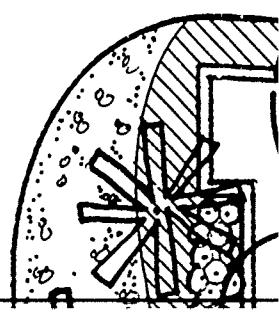
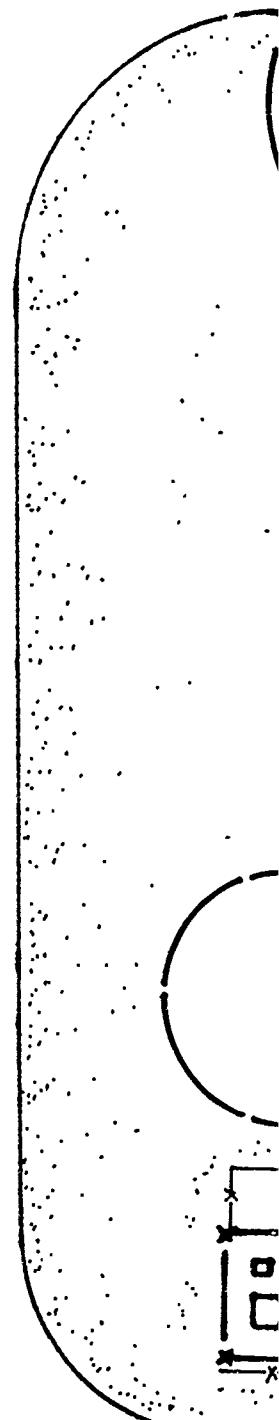
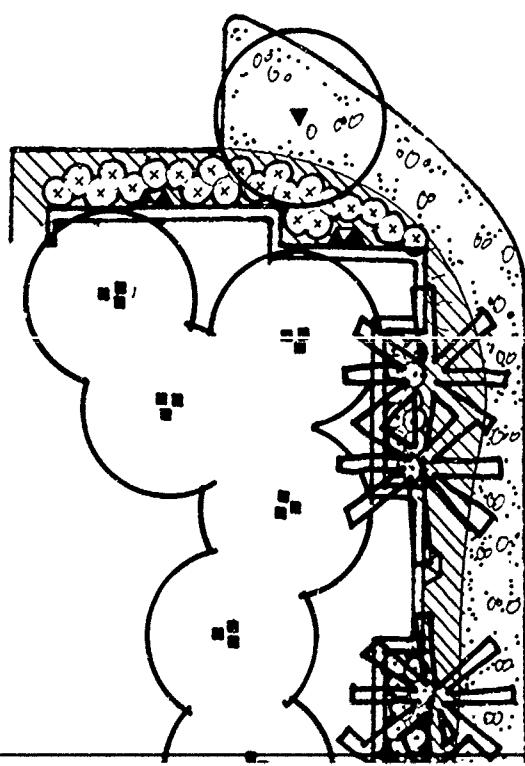
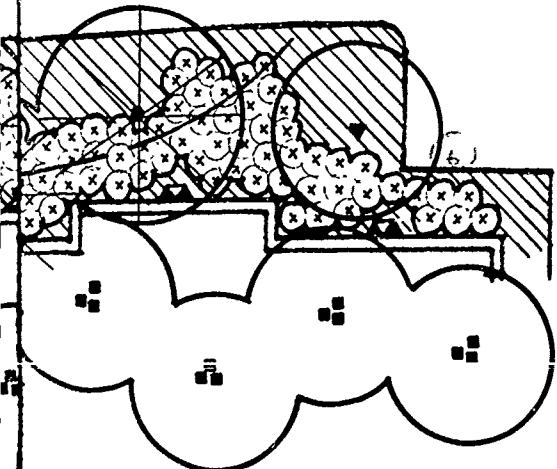
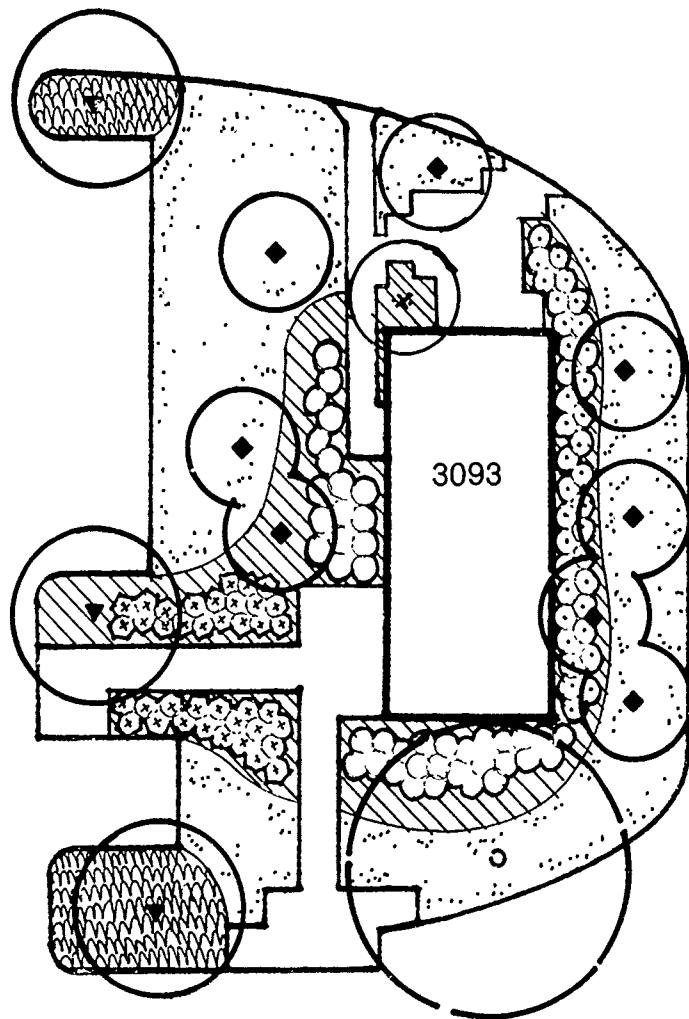
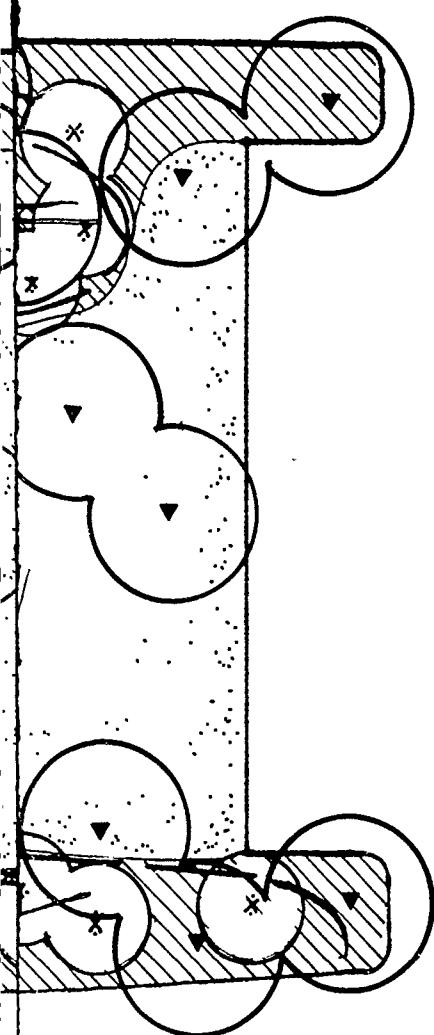


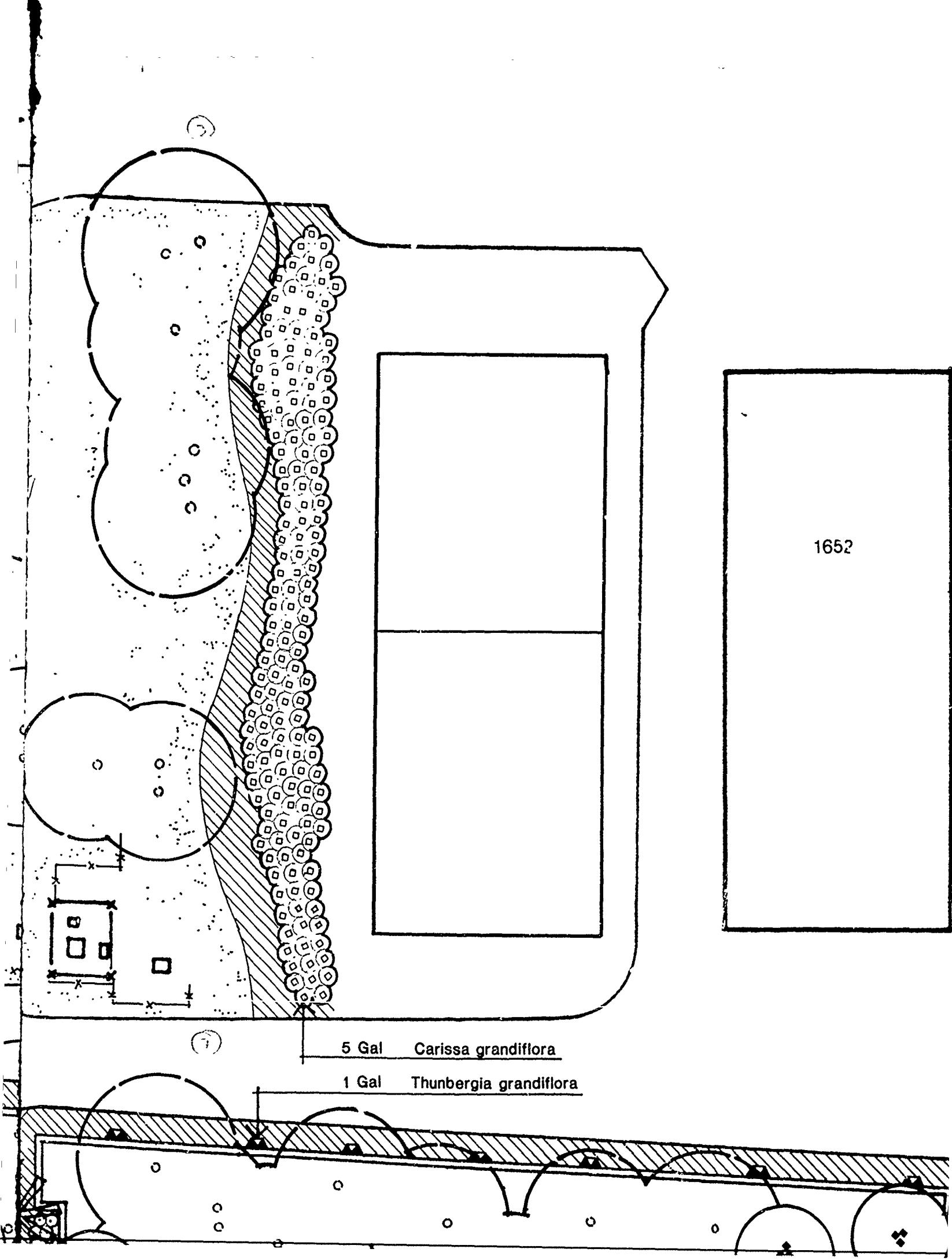
# Ocean Systems Center

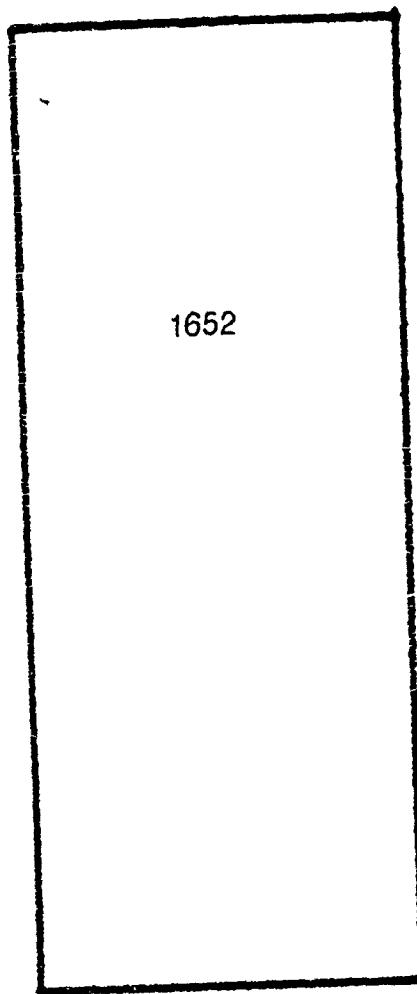
Sheet One

Hawaii Laboratory

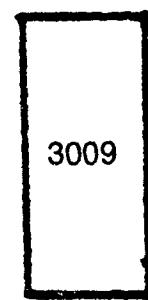




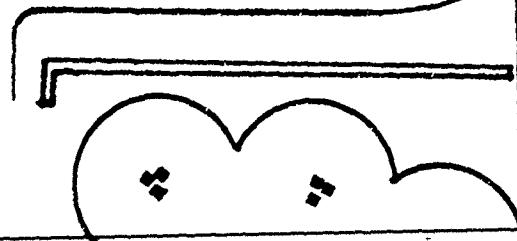
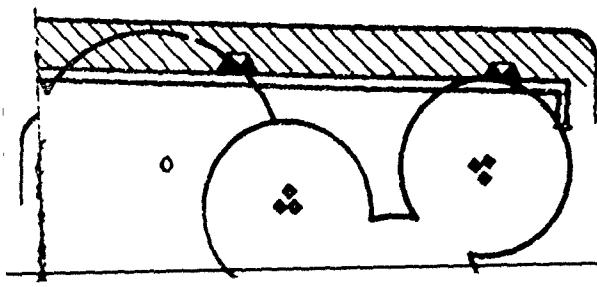


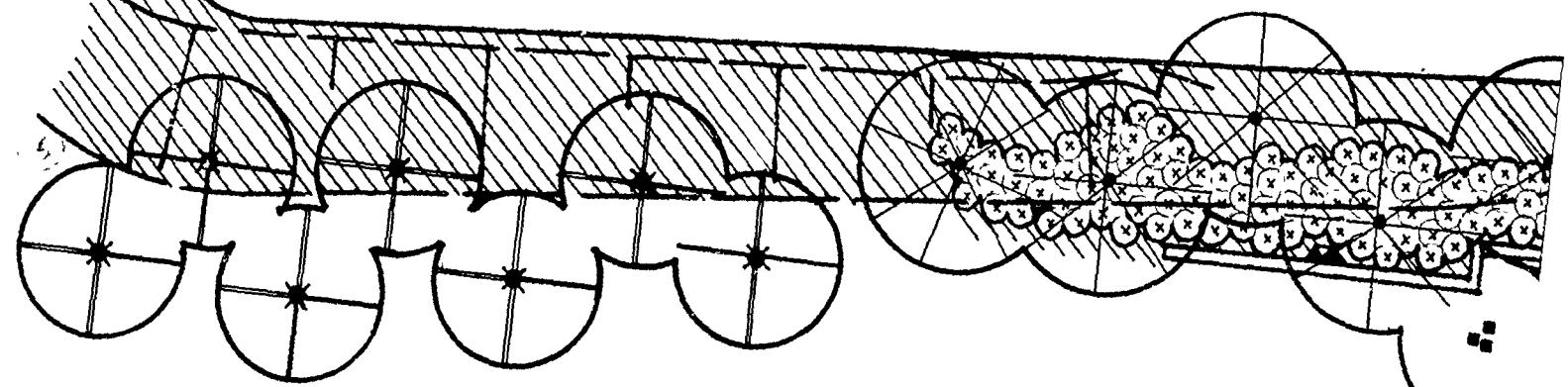


(v)

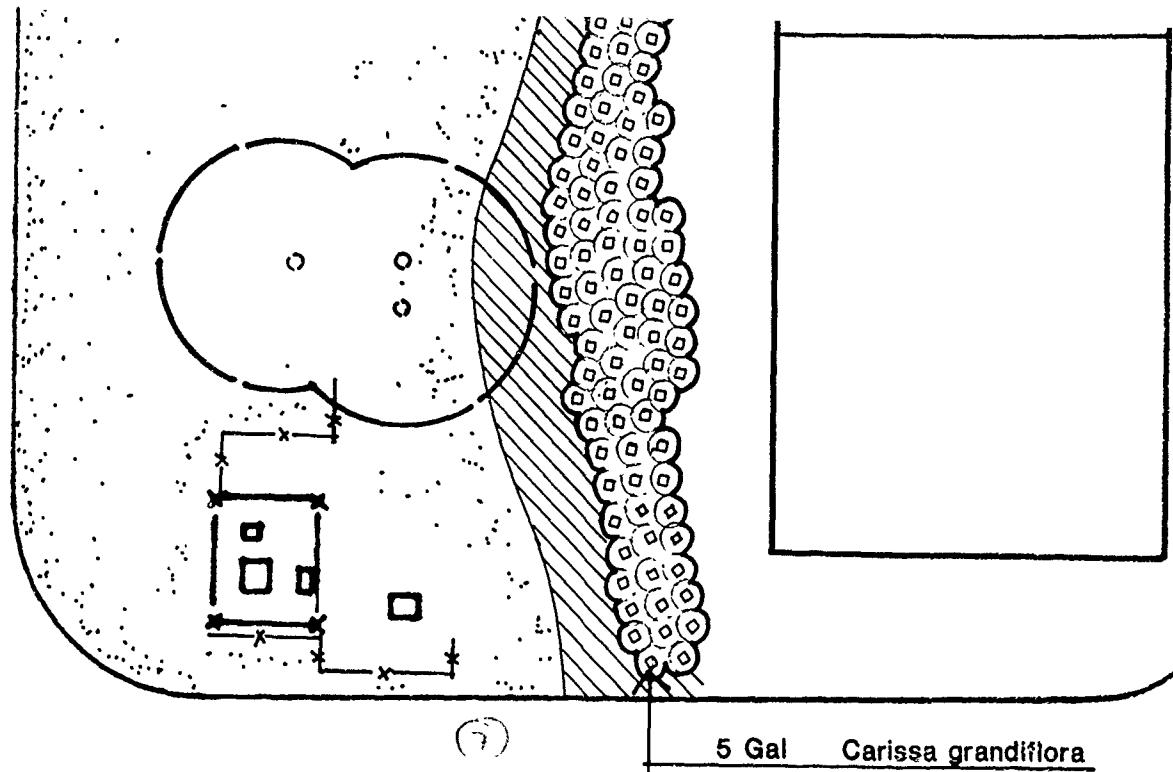


(s)



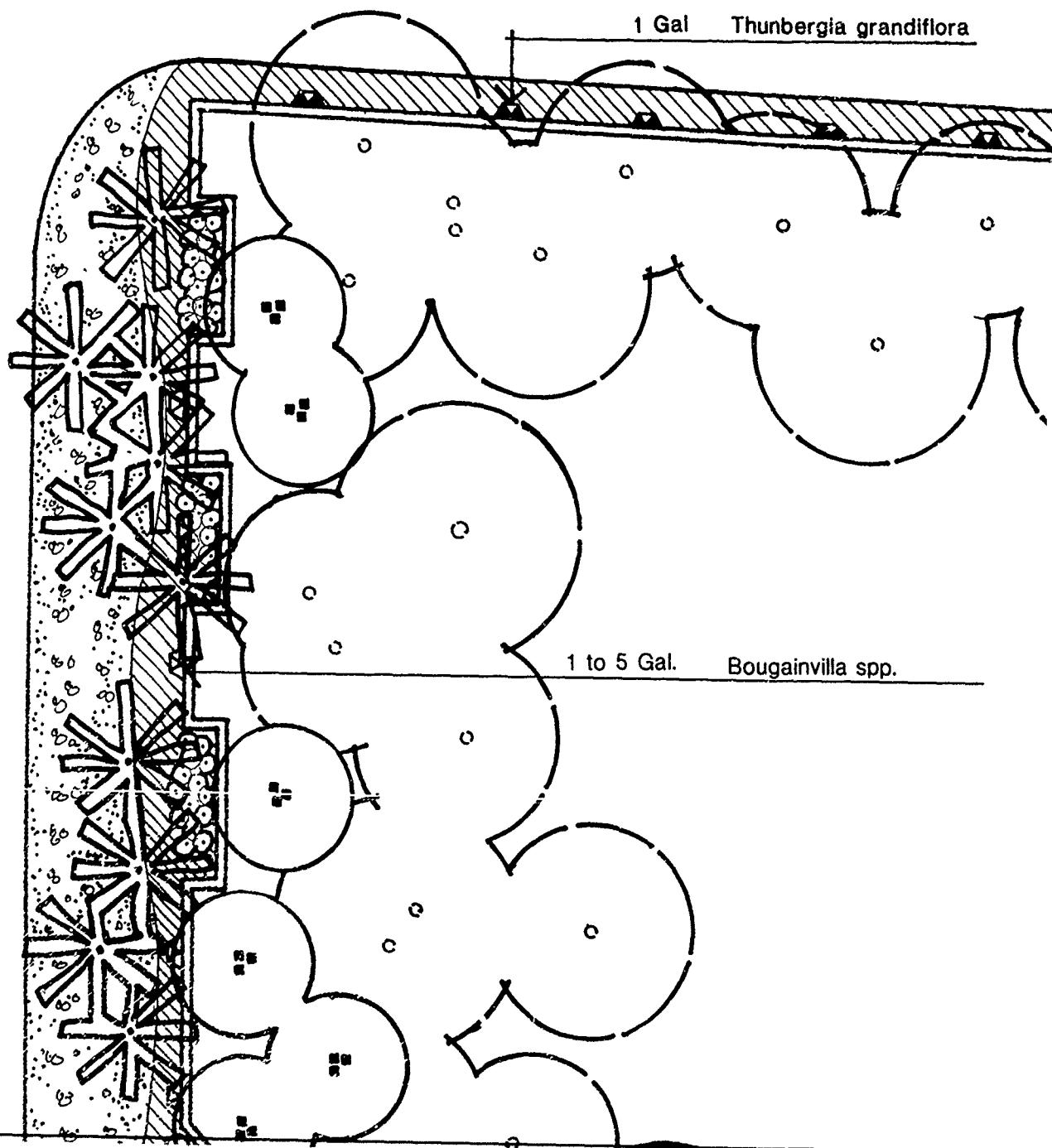


Contractor Trailer Area

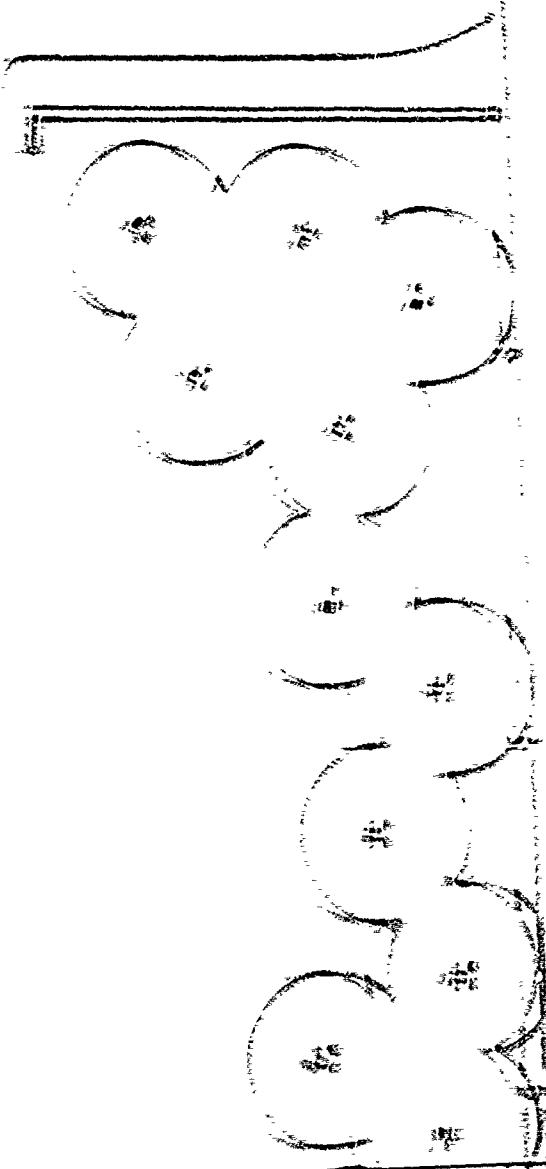


5 Gal *Carissa grandiflora*

1 Gal *Thunbergia grandiflora*

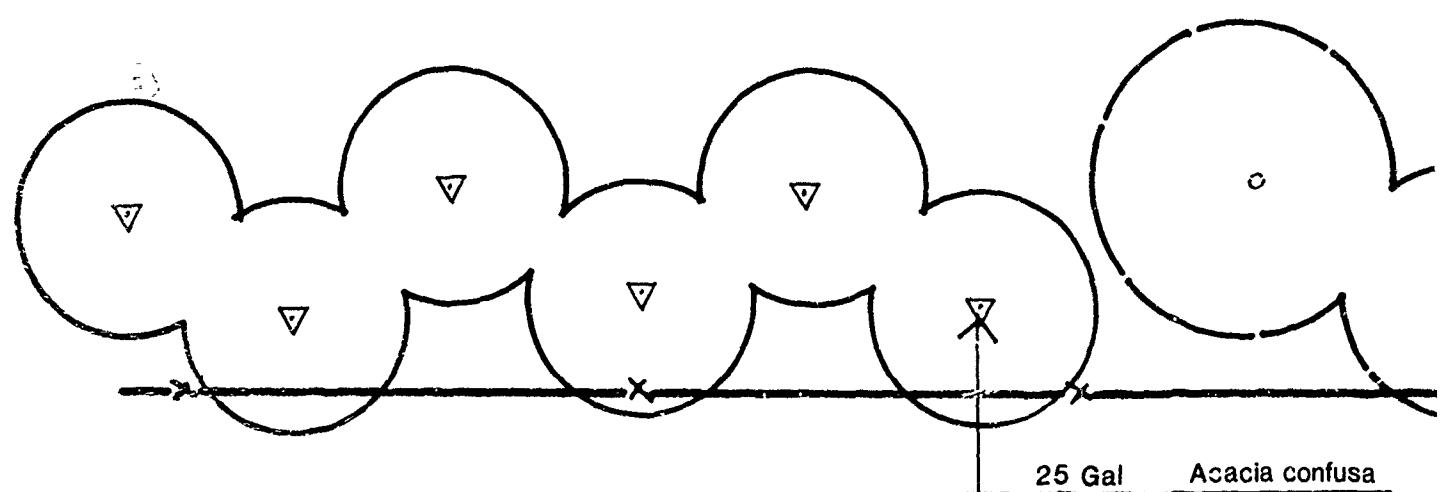


1 to 5 Gal. *Bougainvillea spp.*

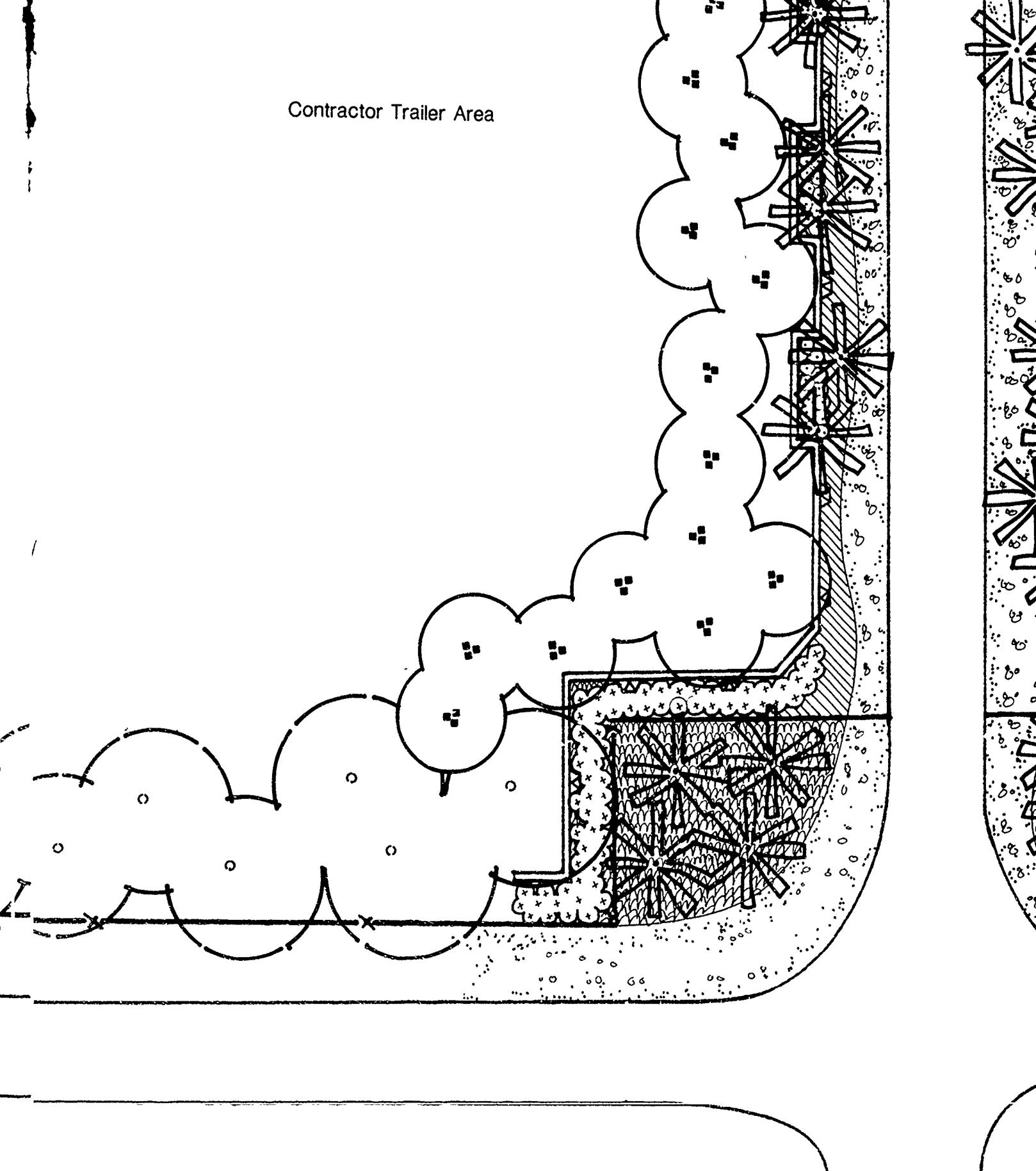


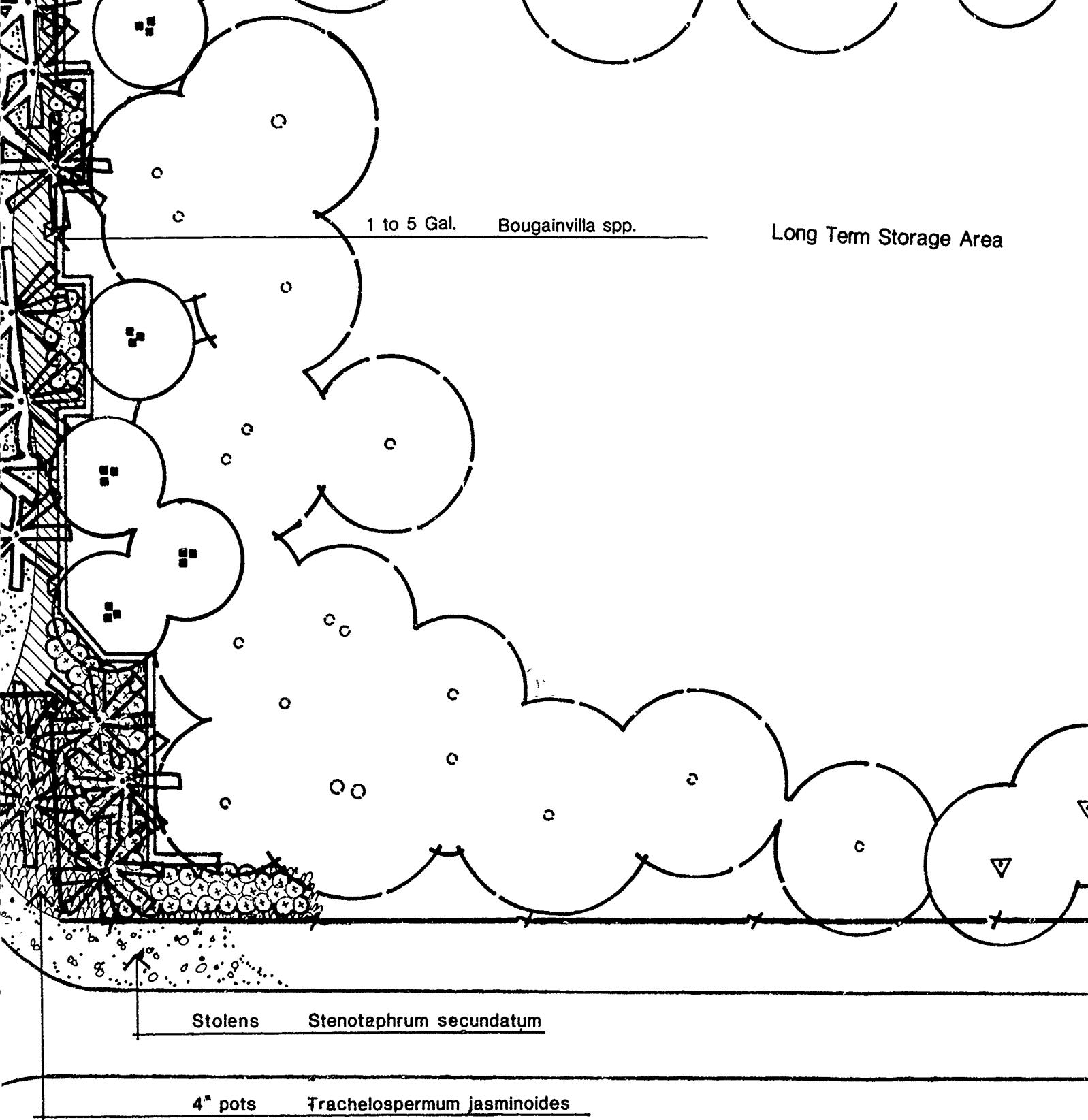
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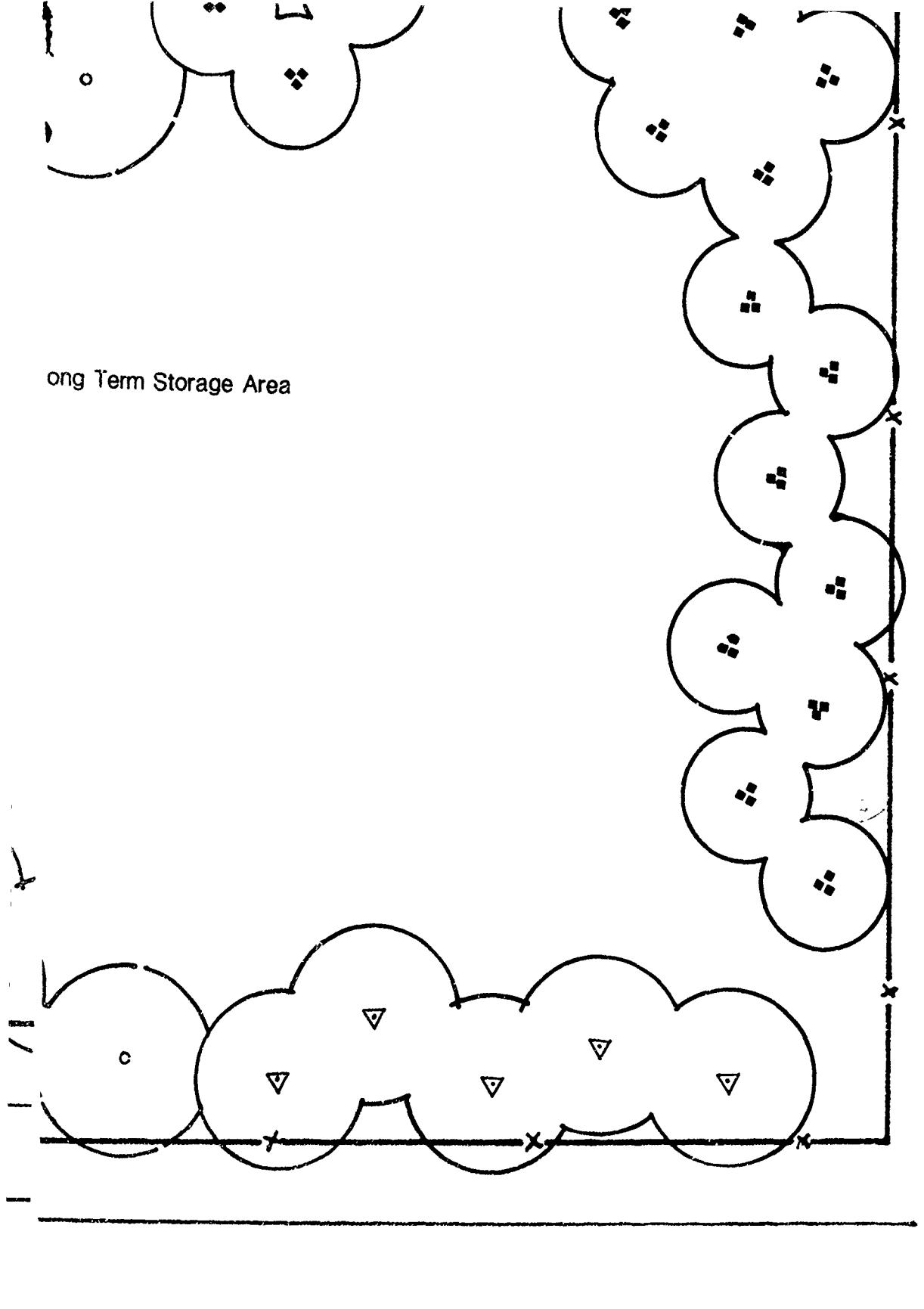
ost: Term Storage Area

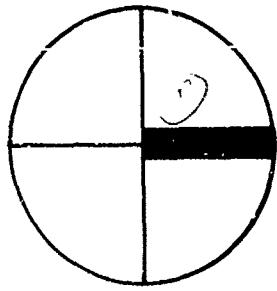
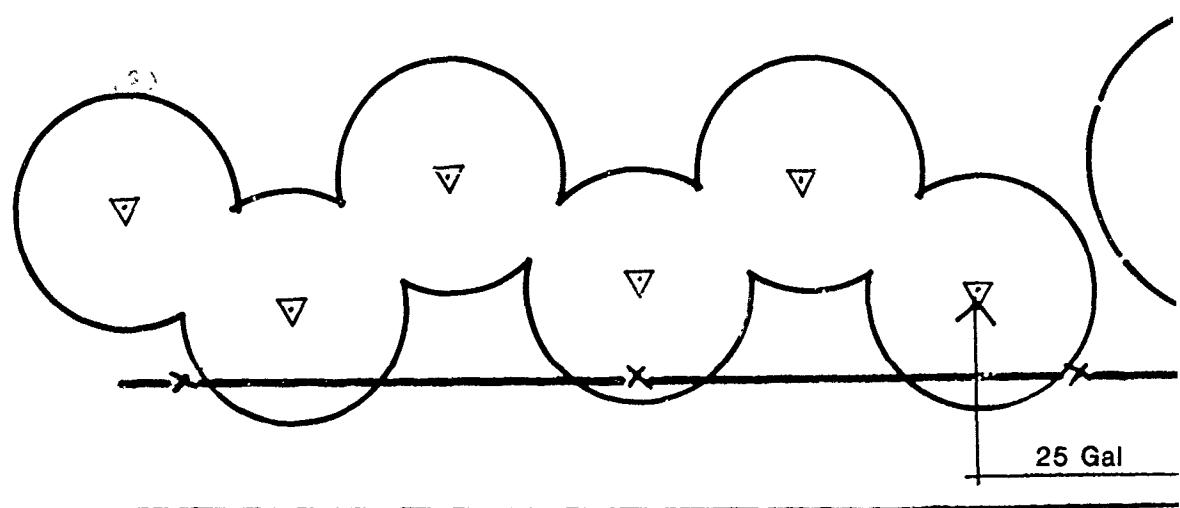


Contractor Trailer Area

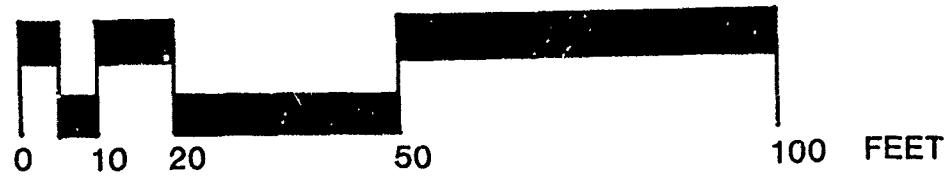




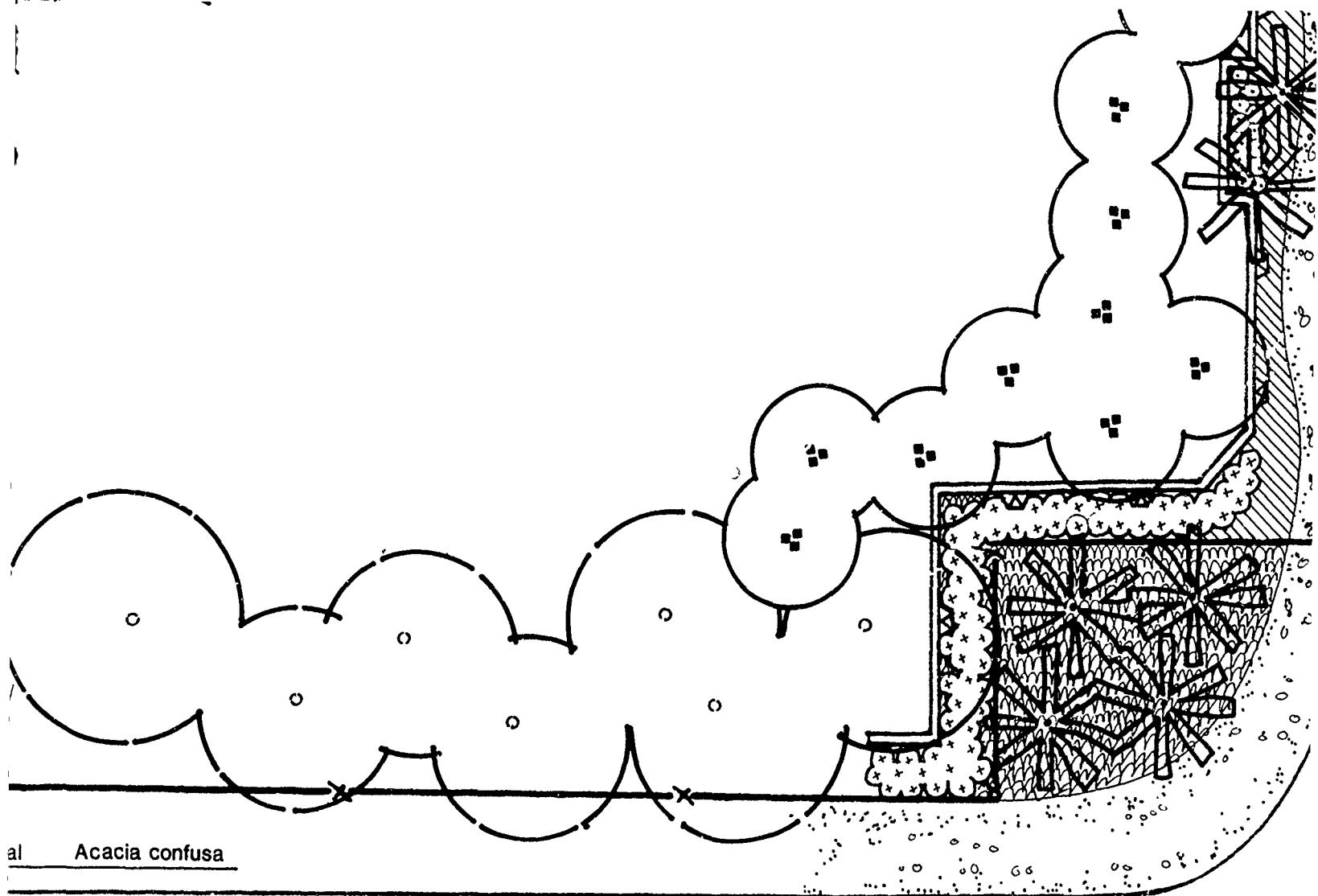




NORTH

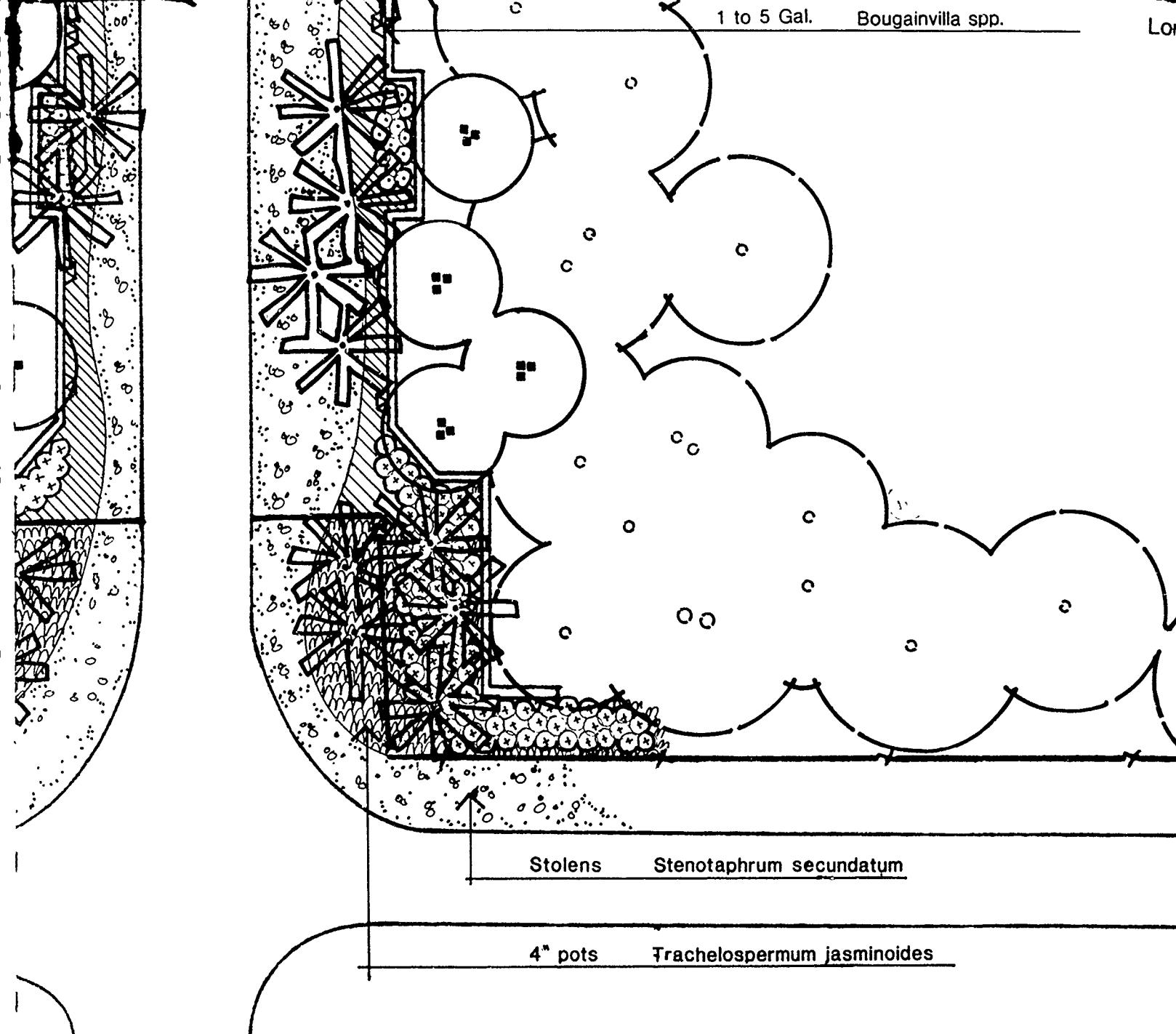


100 FEET



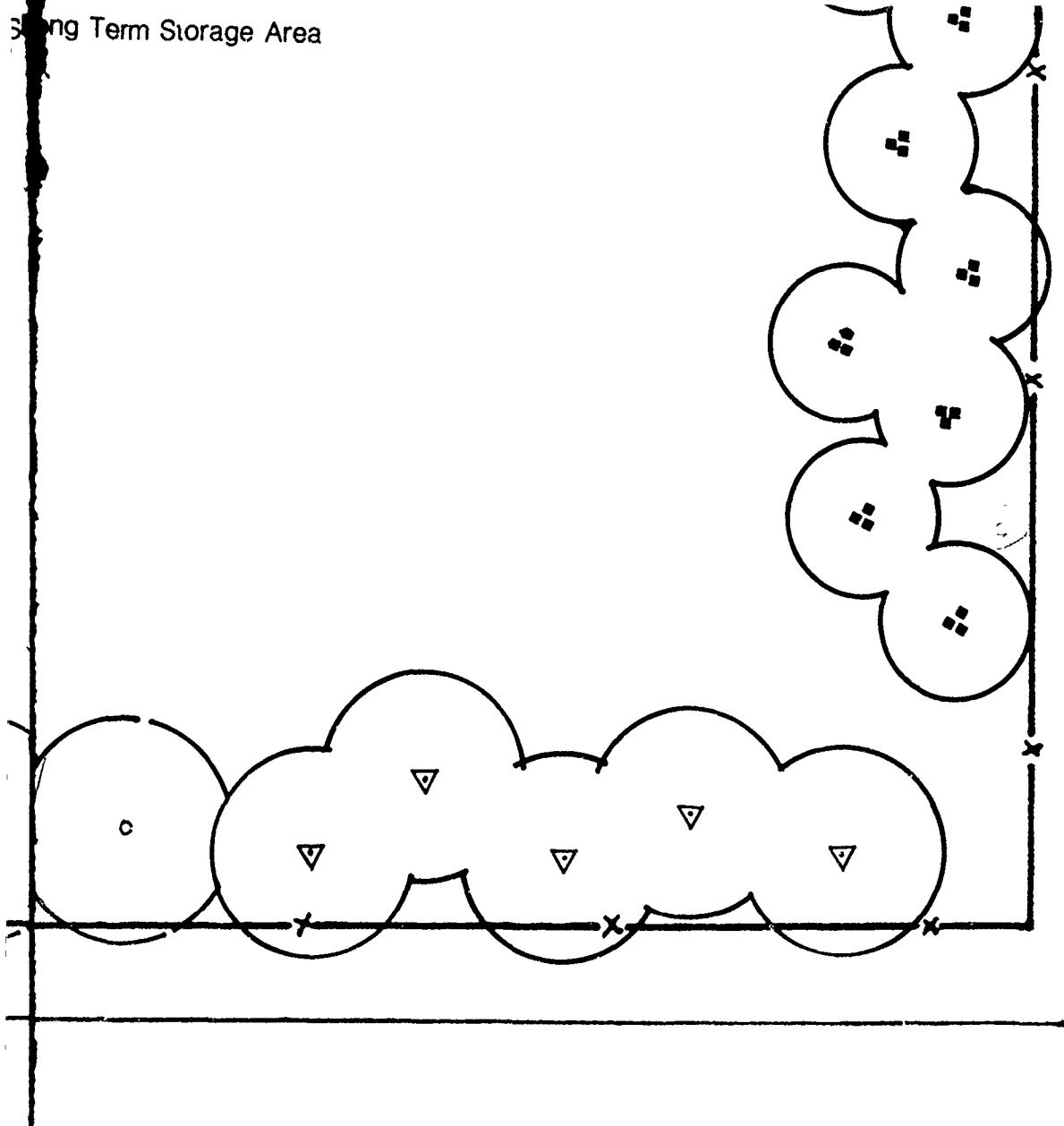
al Acacia confusa

# Landscape Ma

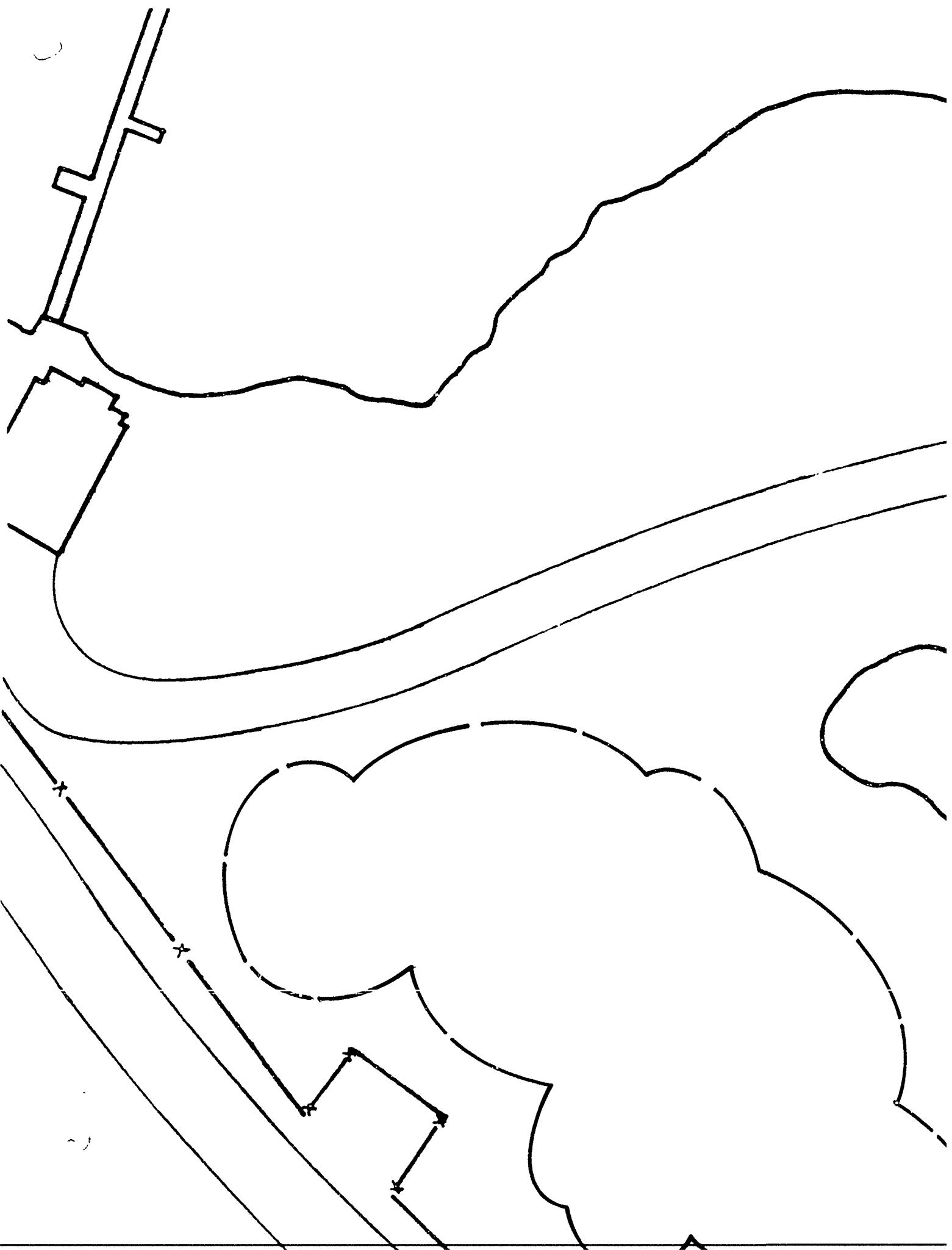


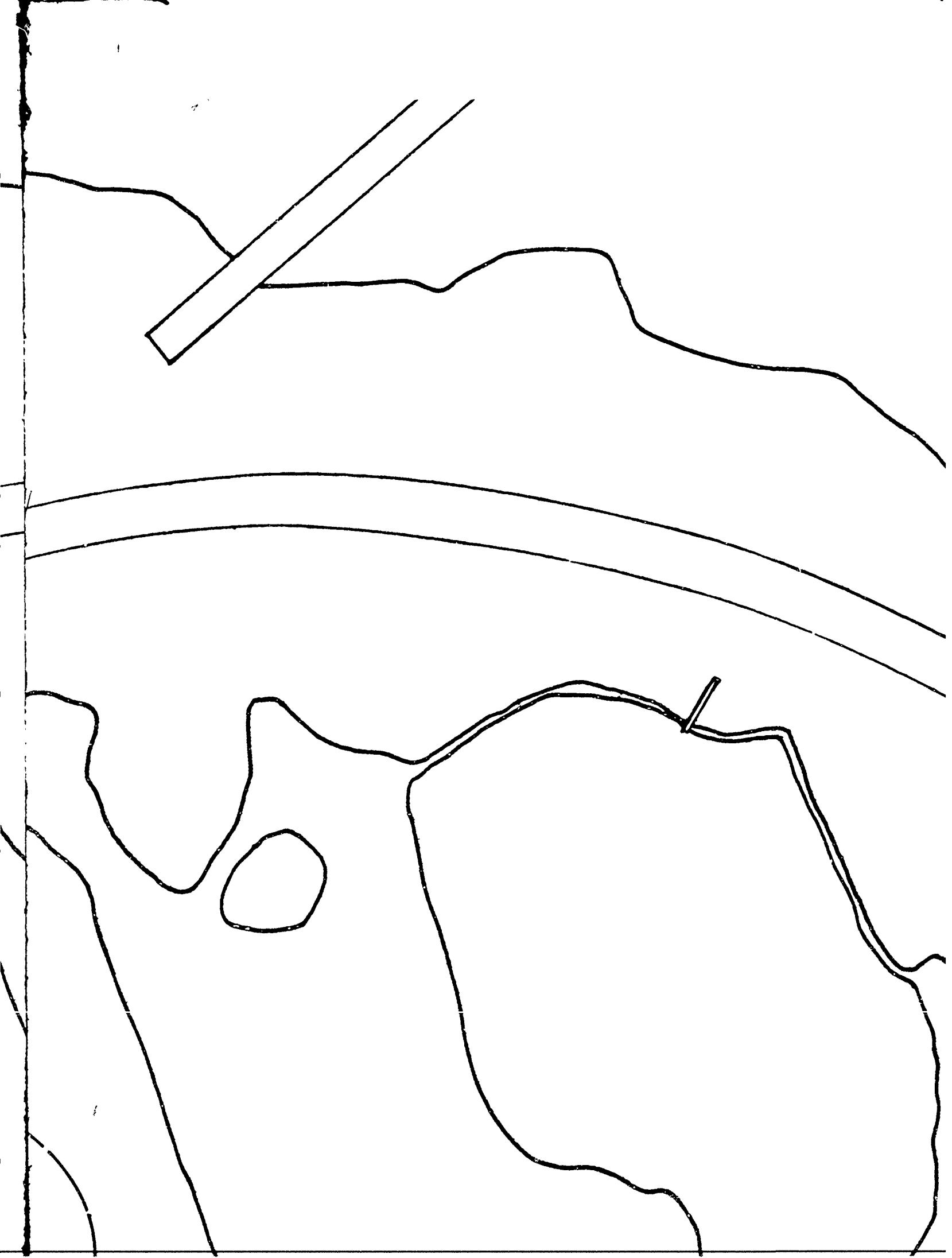
Master Plan

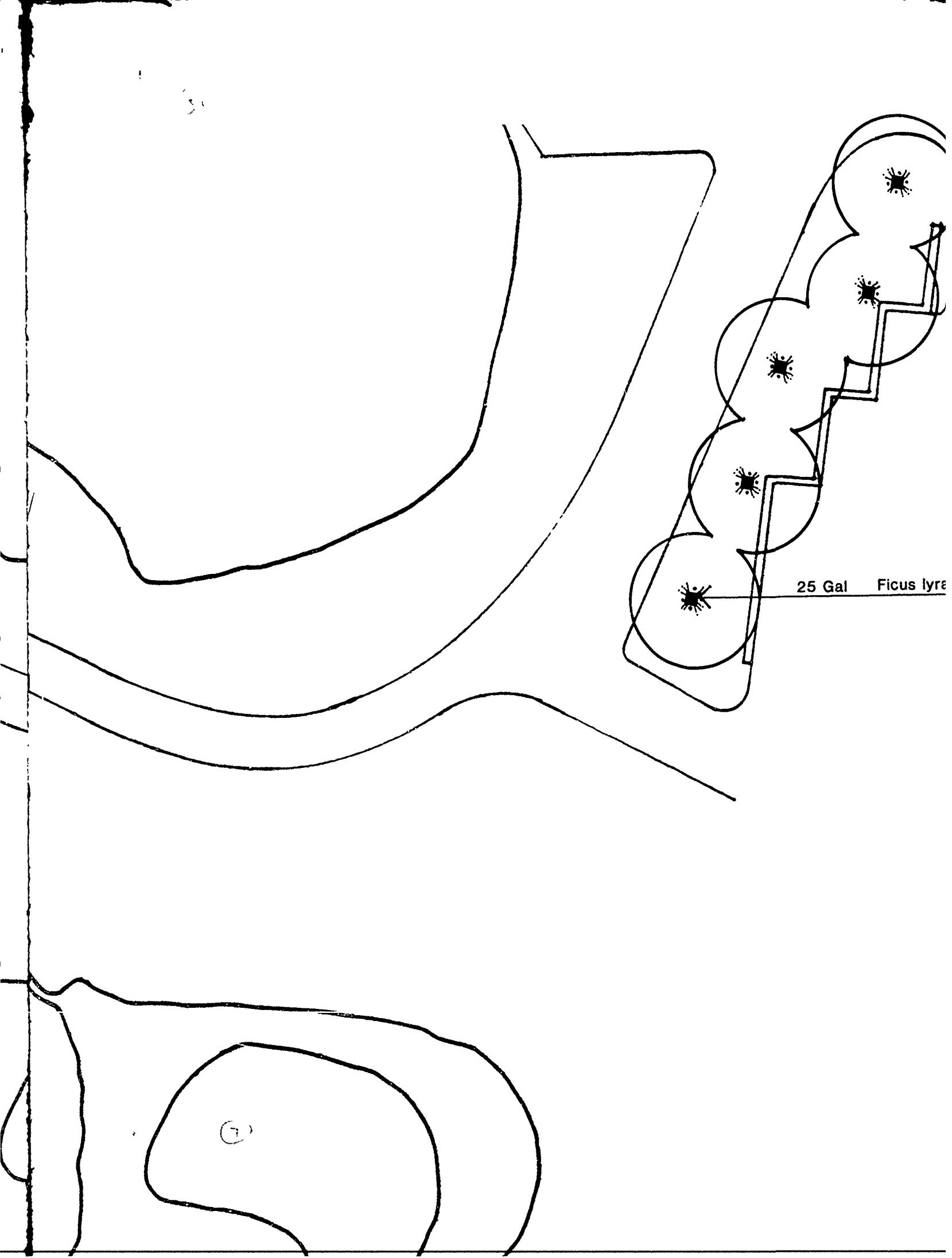
Nav



**31 Ocean Systems Center**  
Sheet Two      **Hawaii Laboratory**

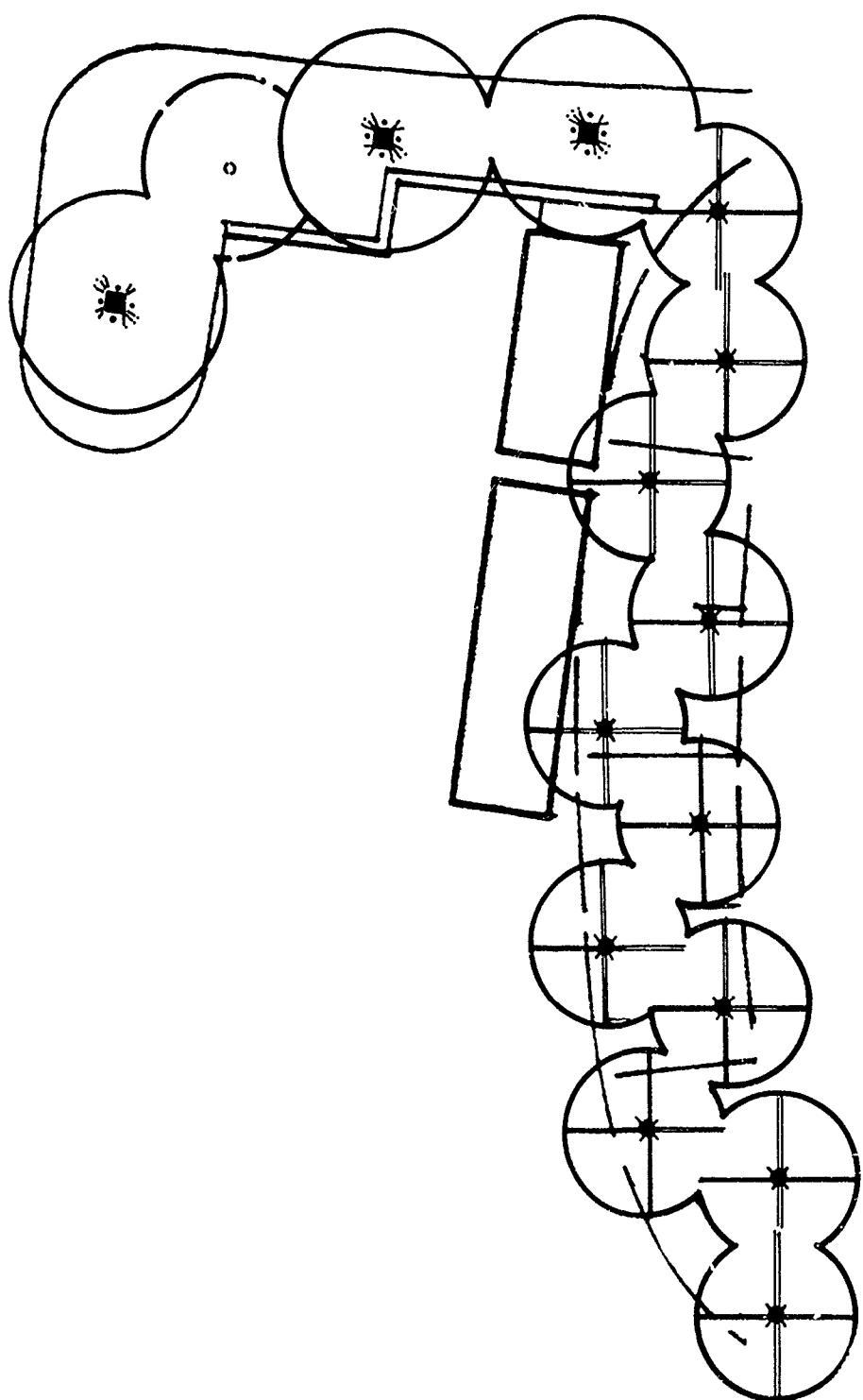






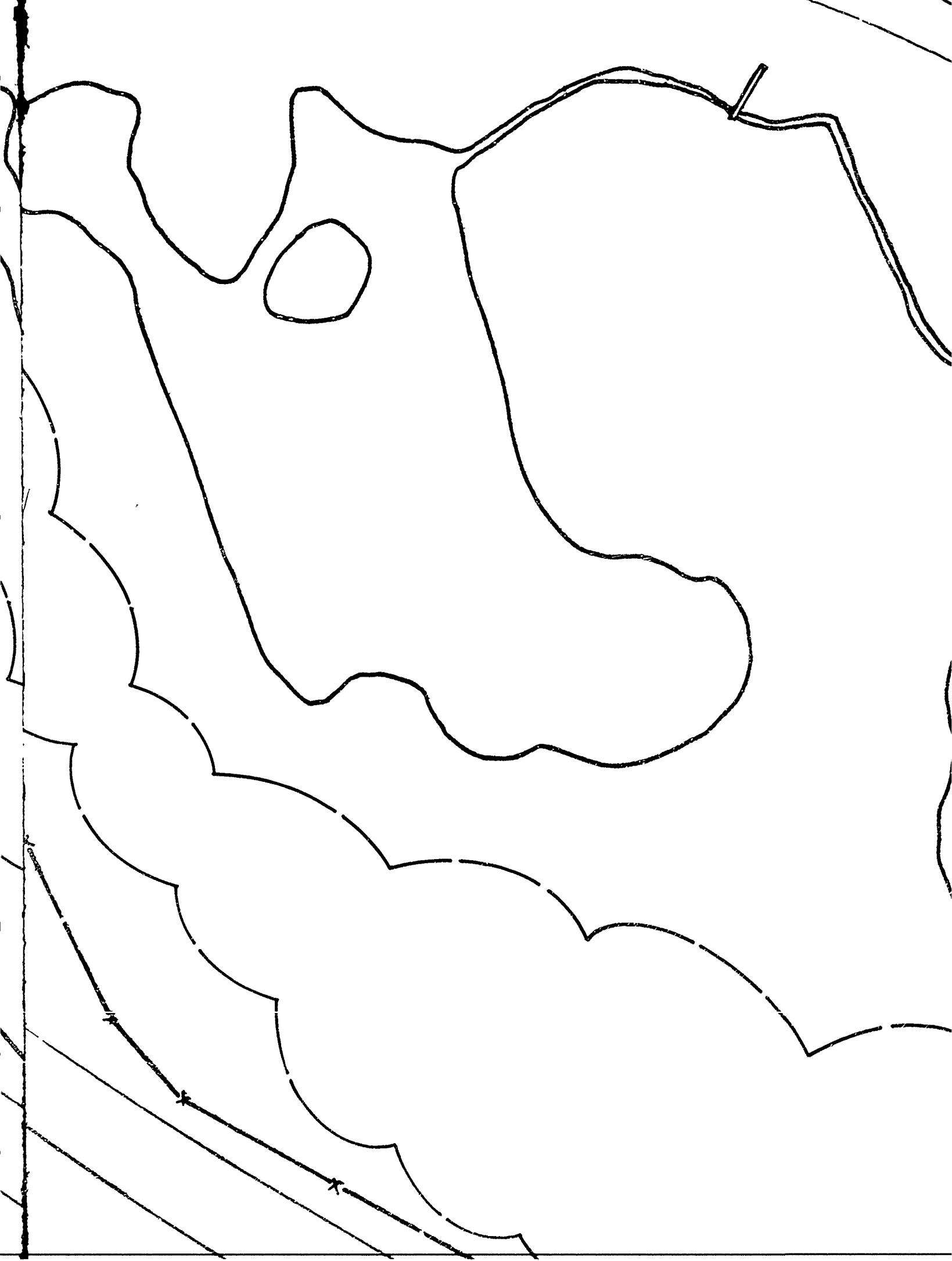
25 Gal Ficus lyra

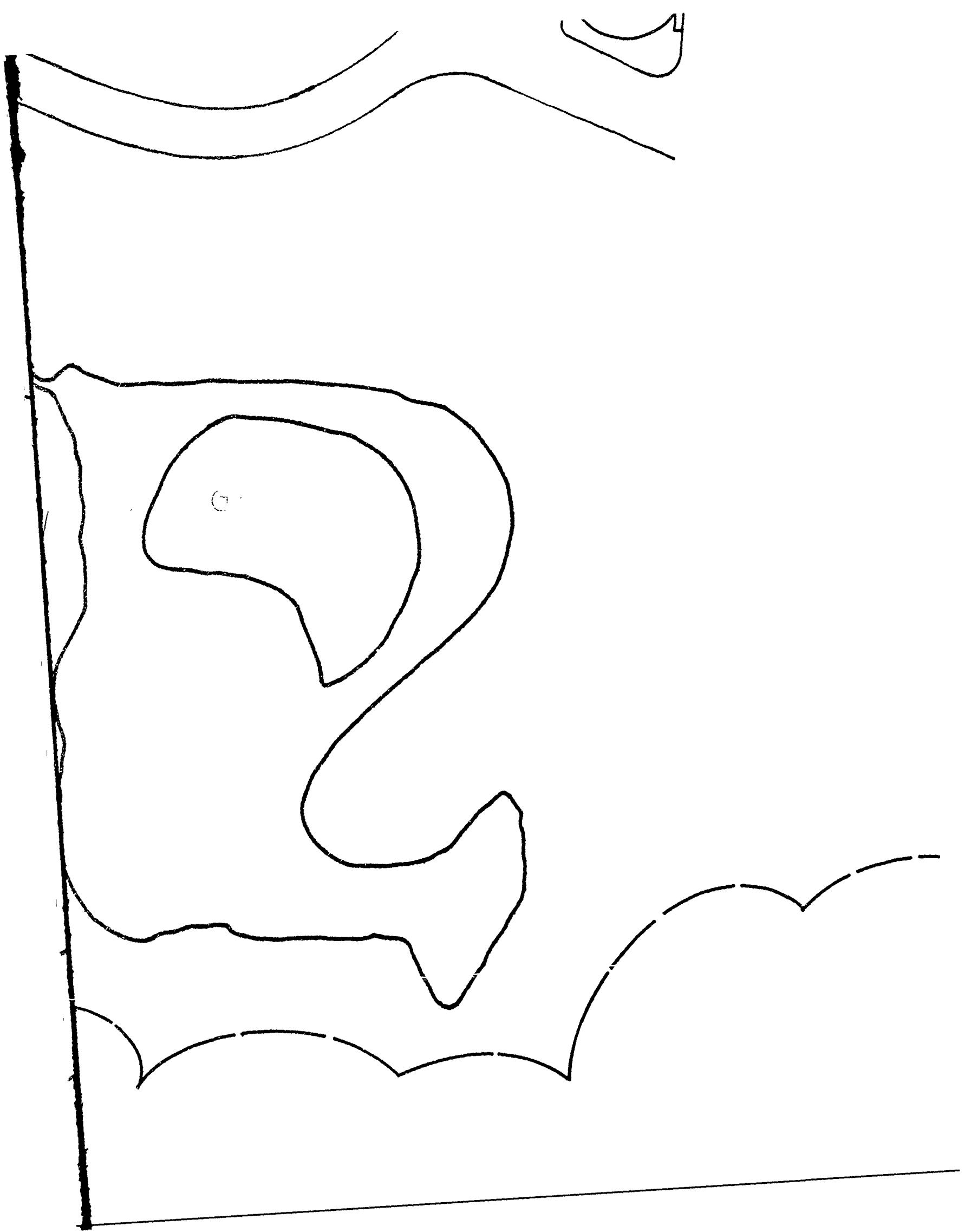
(a)

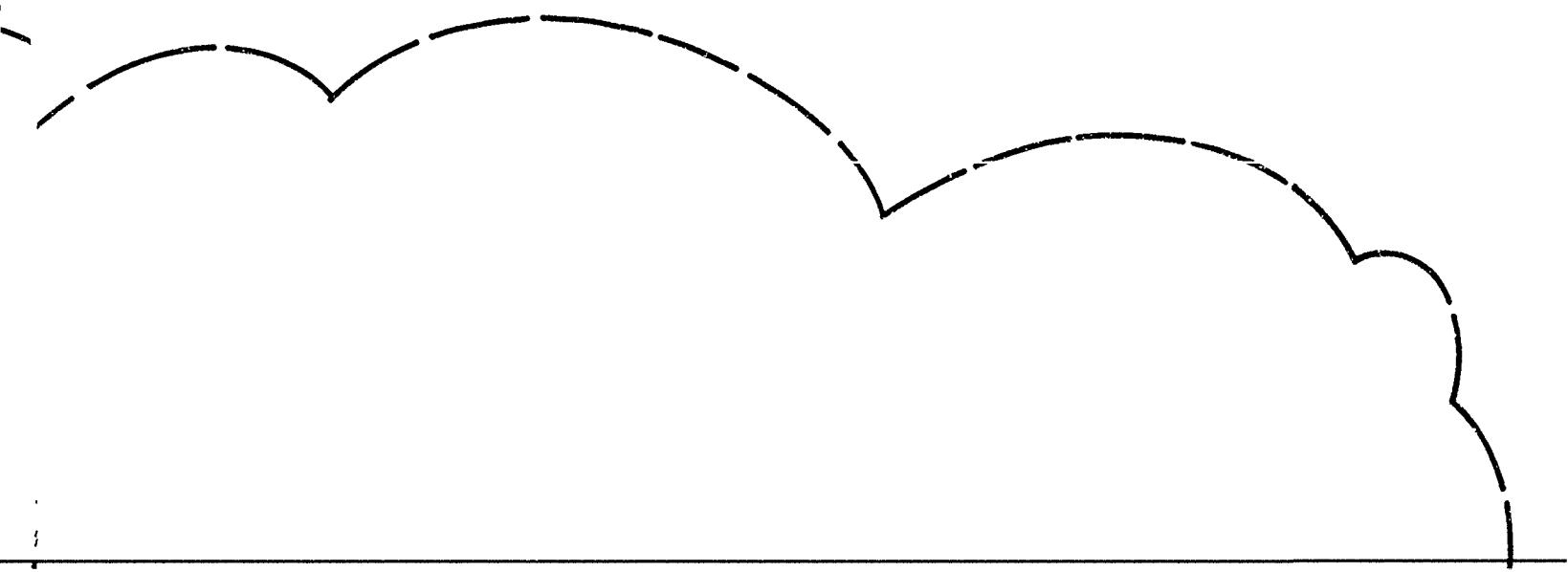


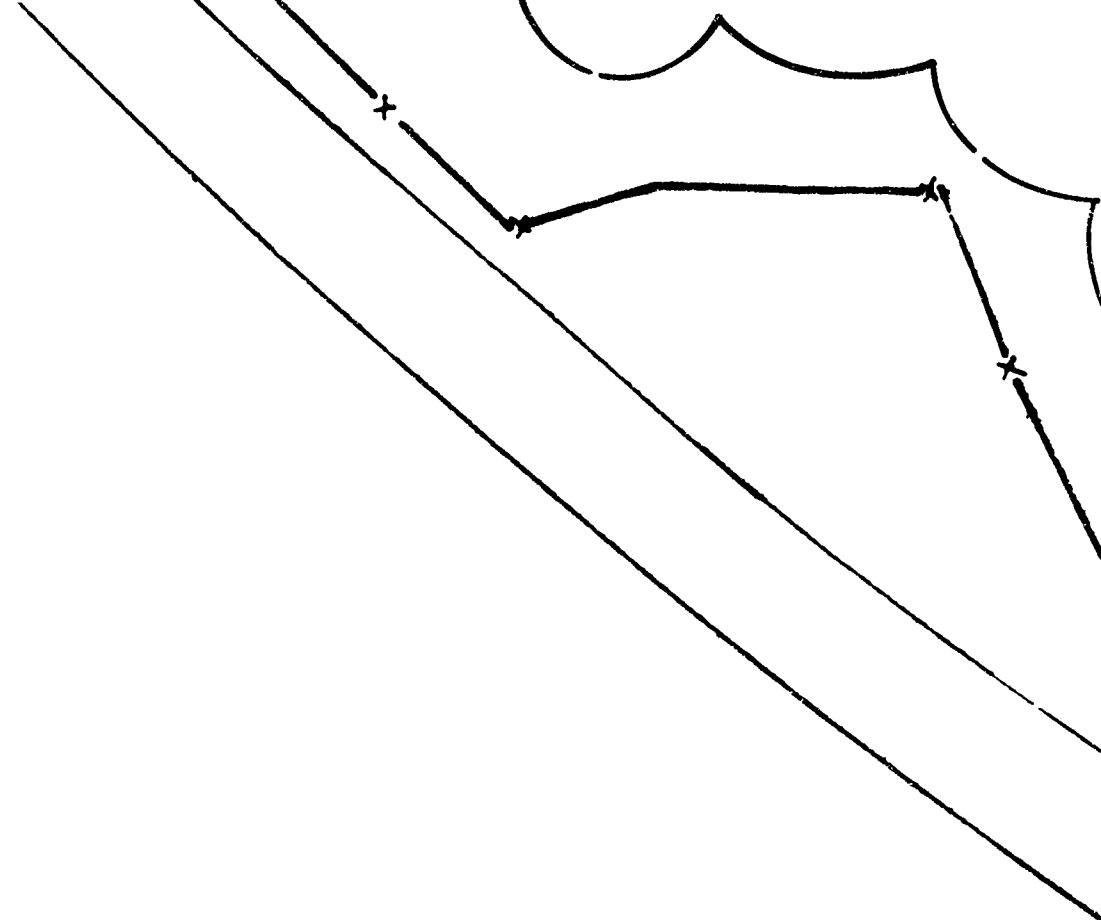
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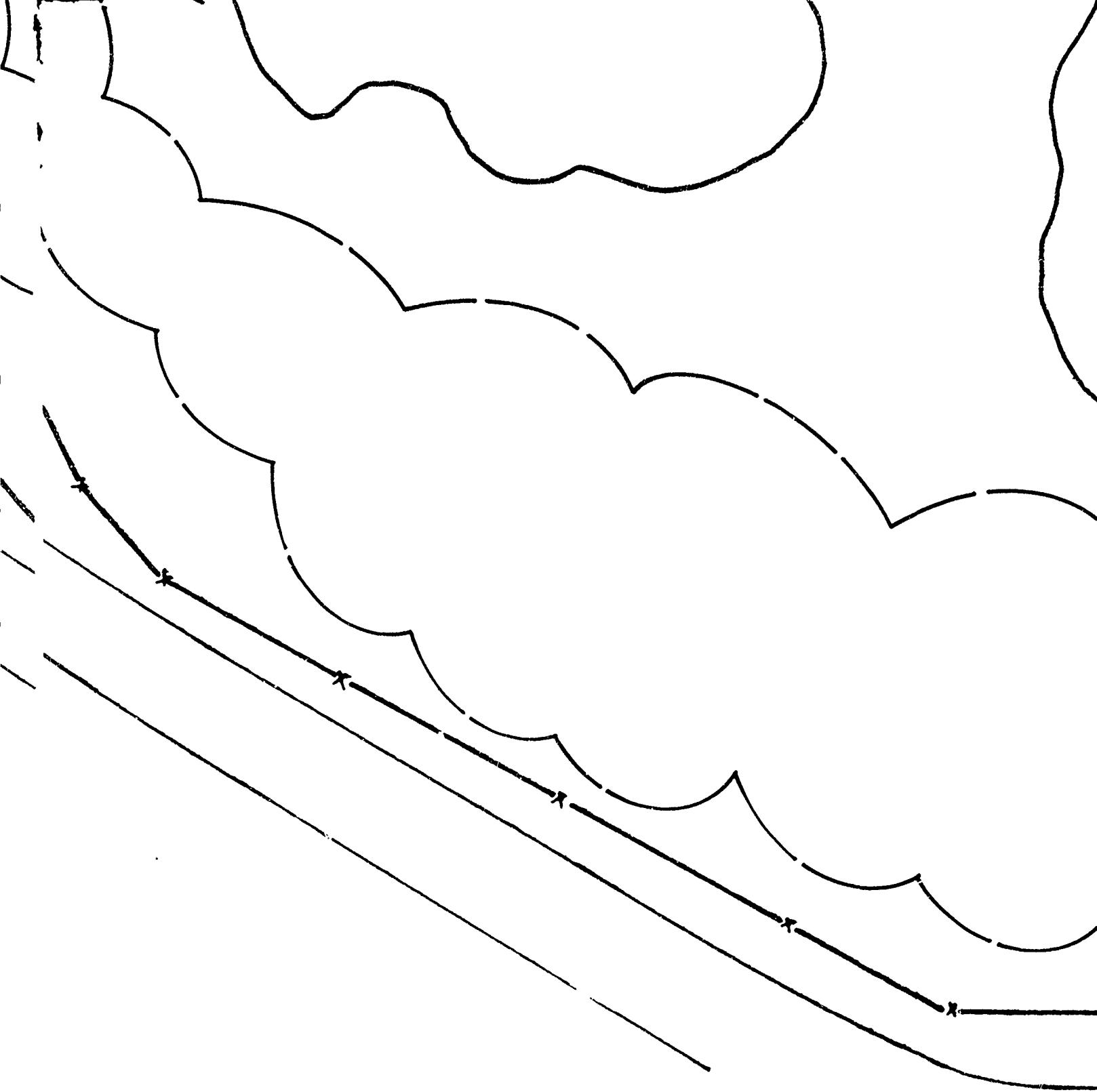


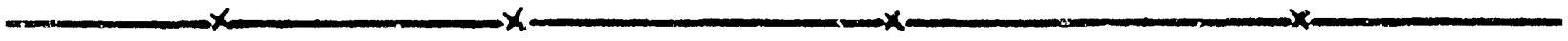
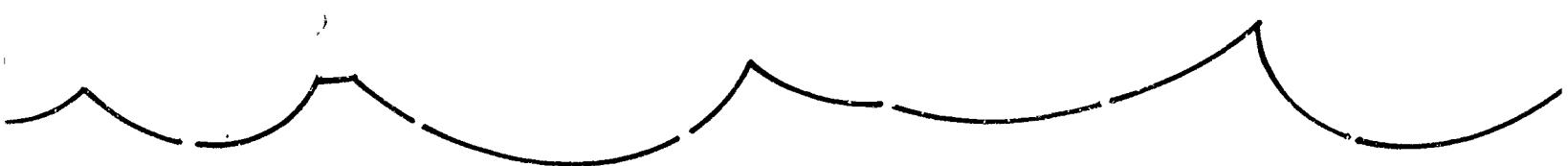
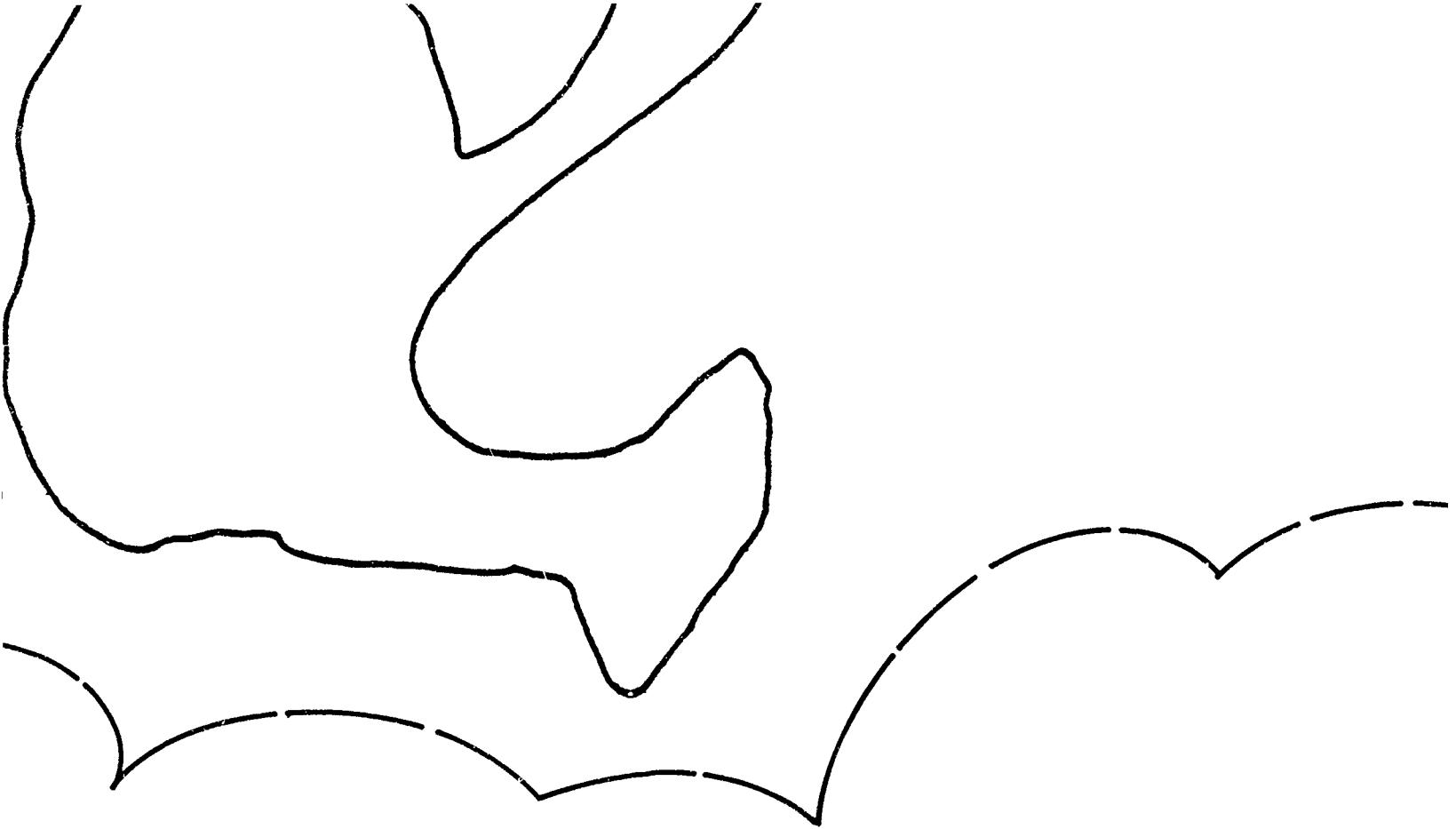


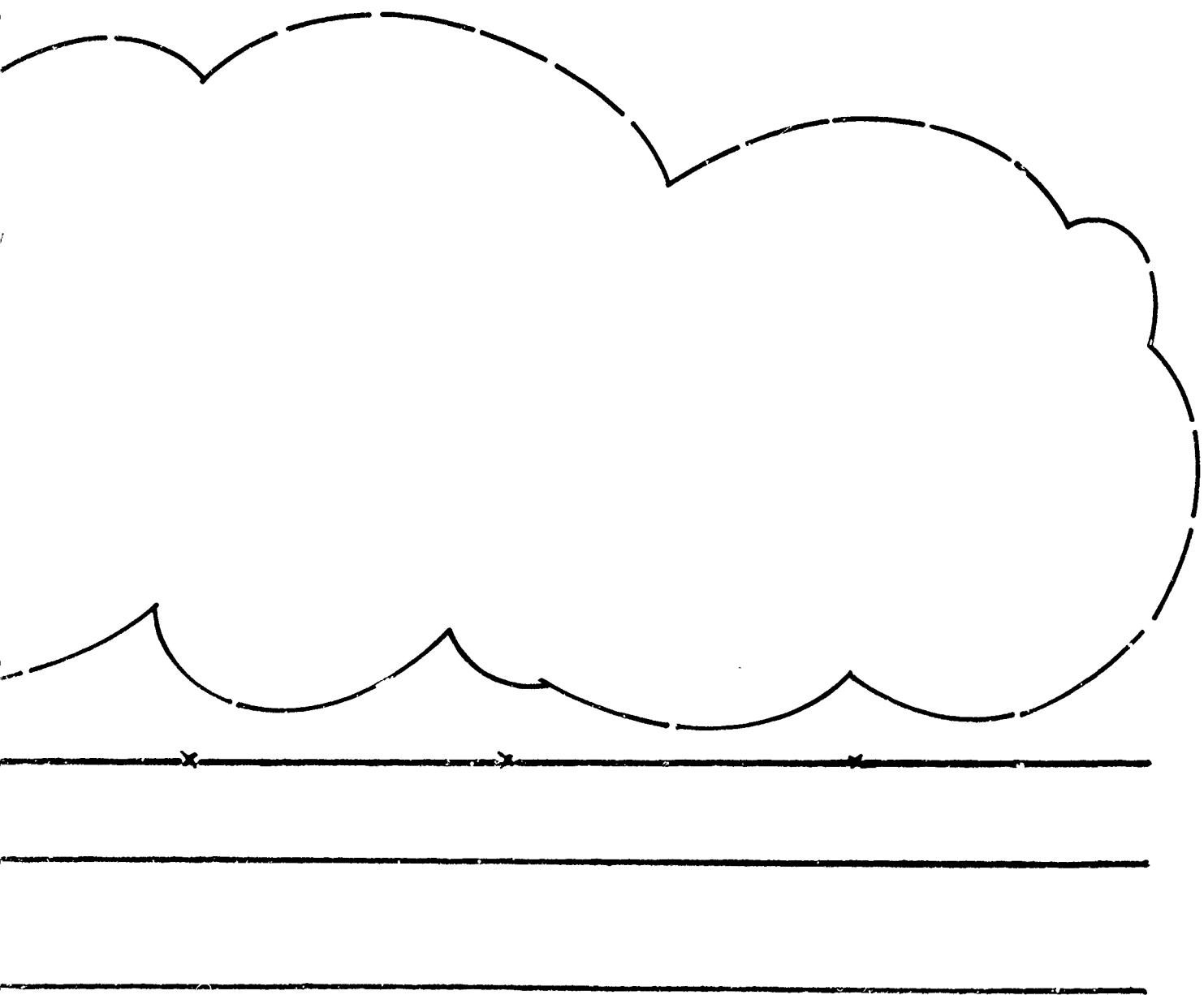


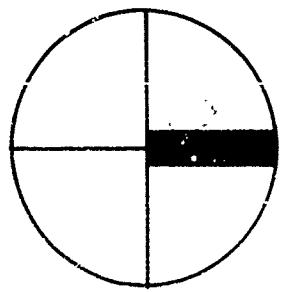




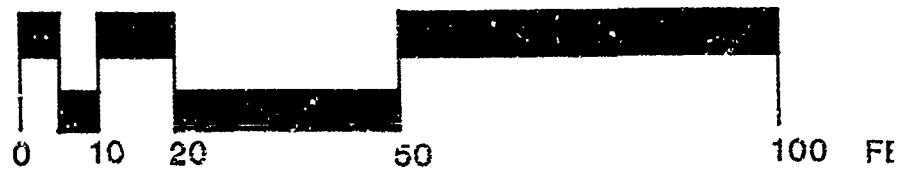


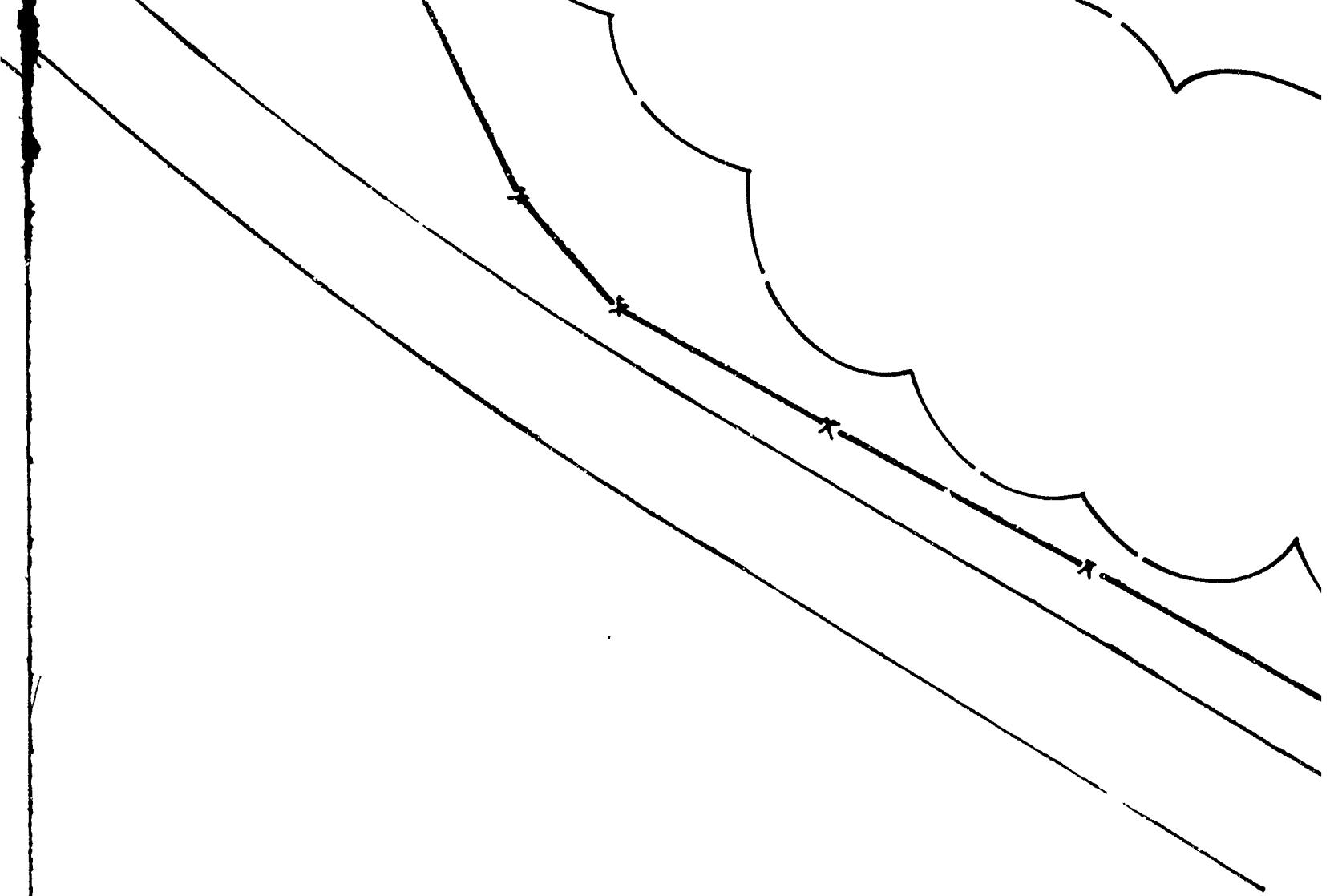






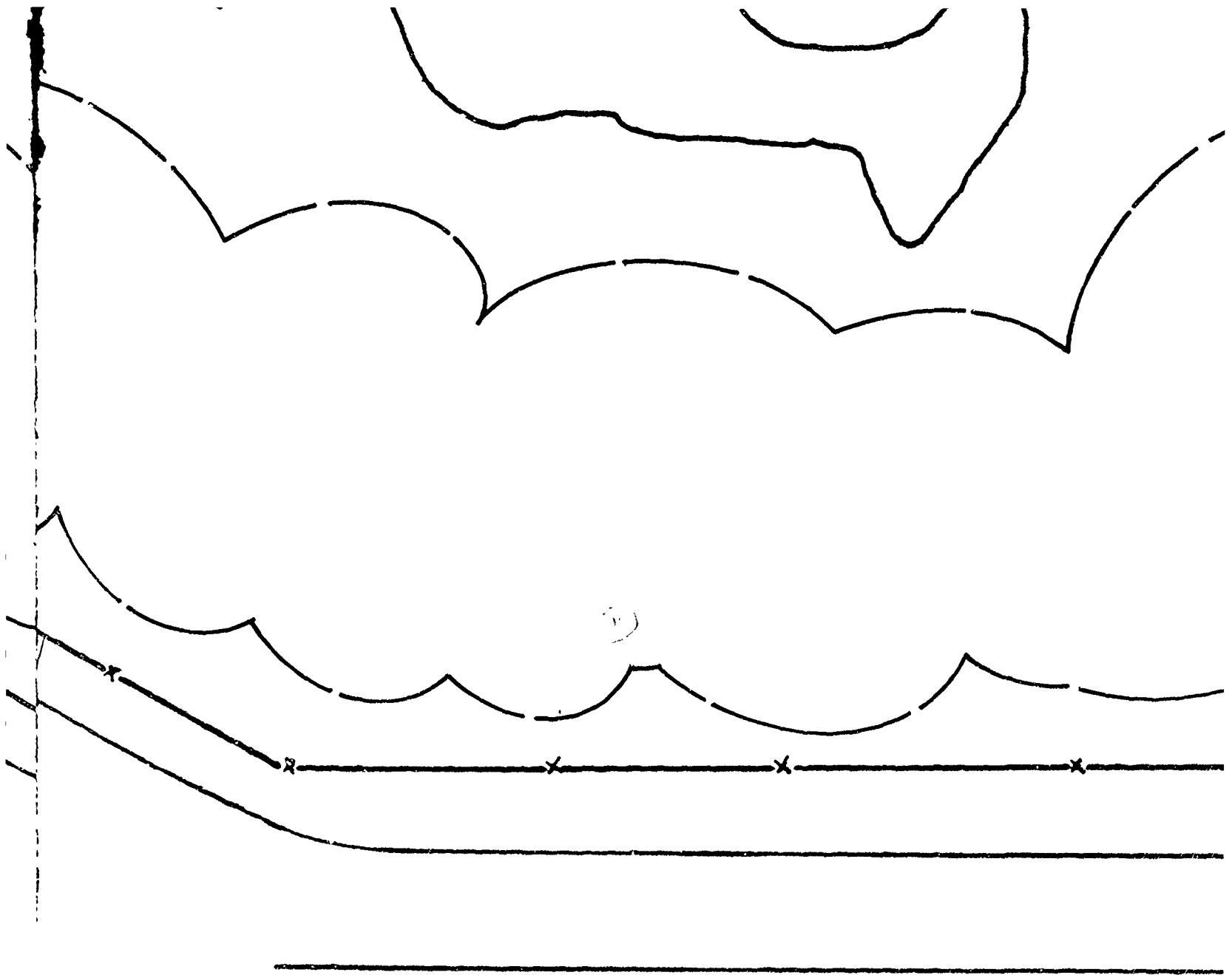
NORTH





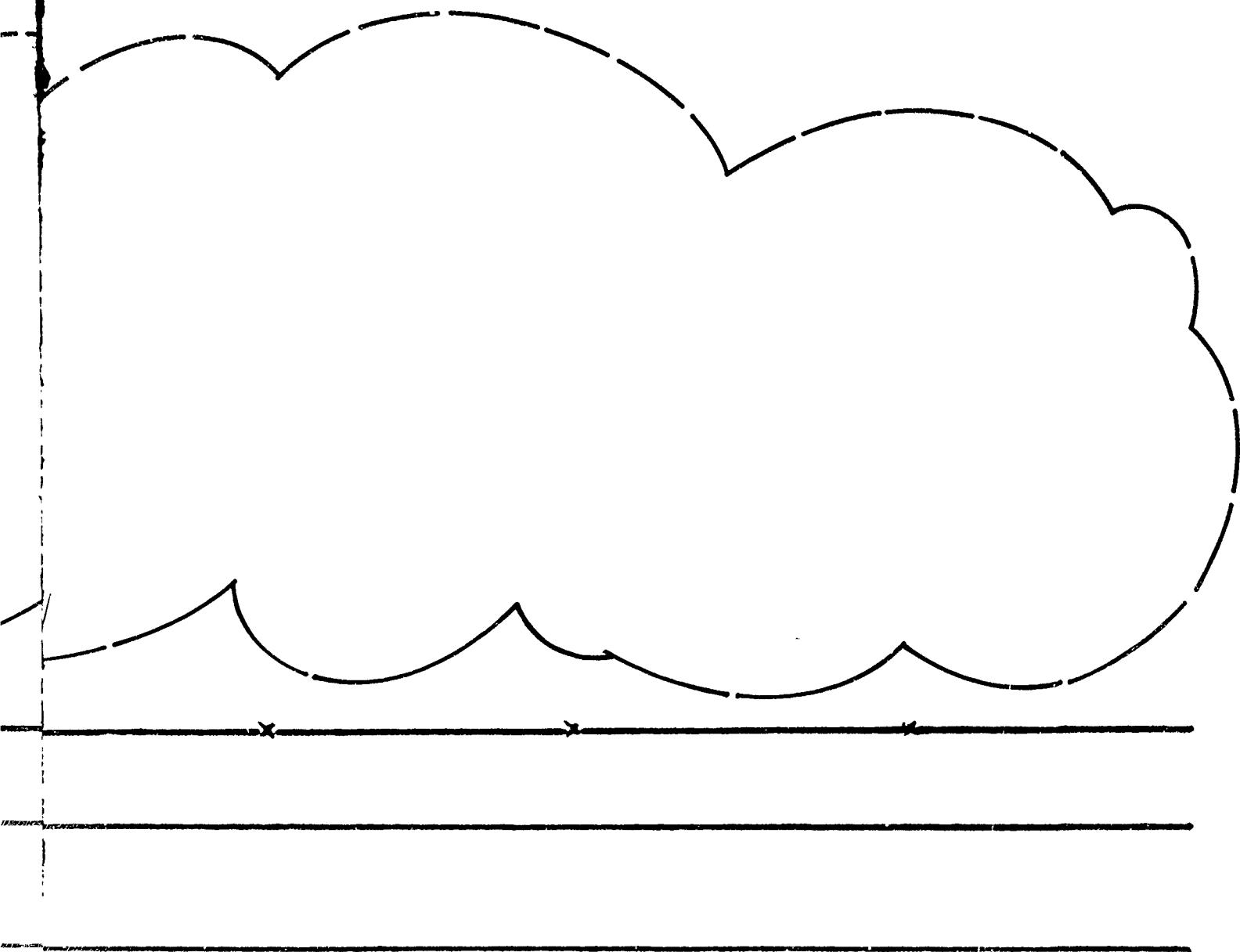
# Landscape Ma

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taster Plan

Naval



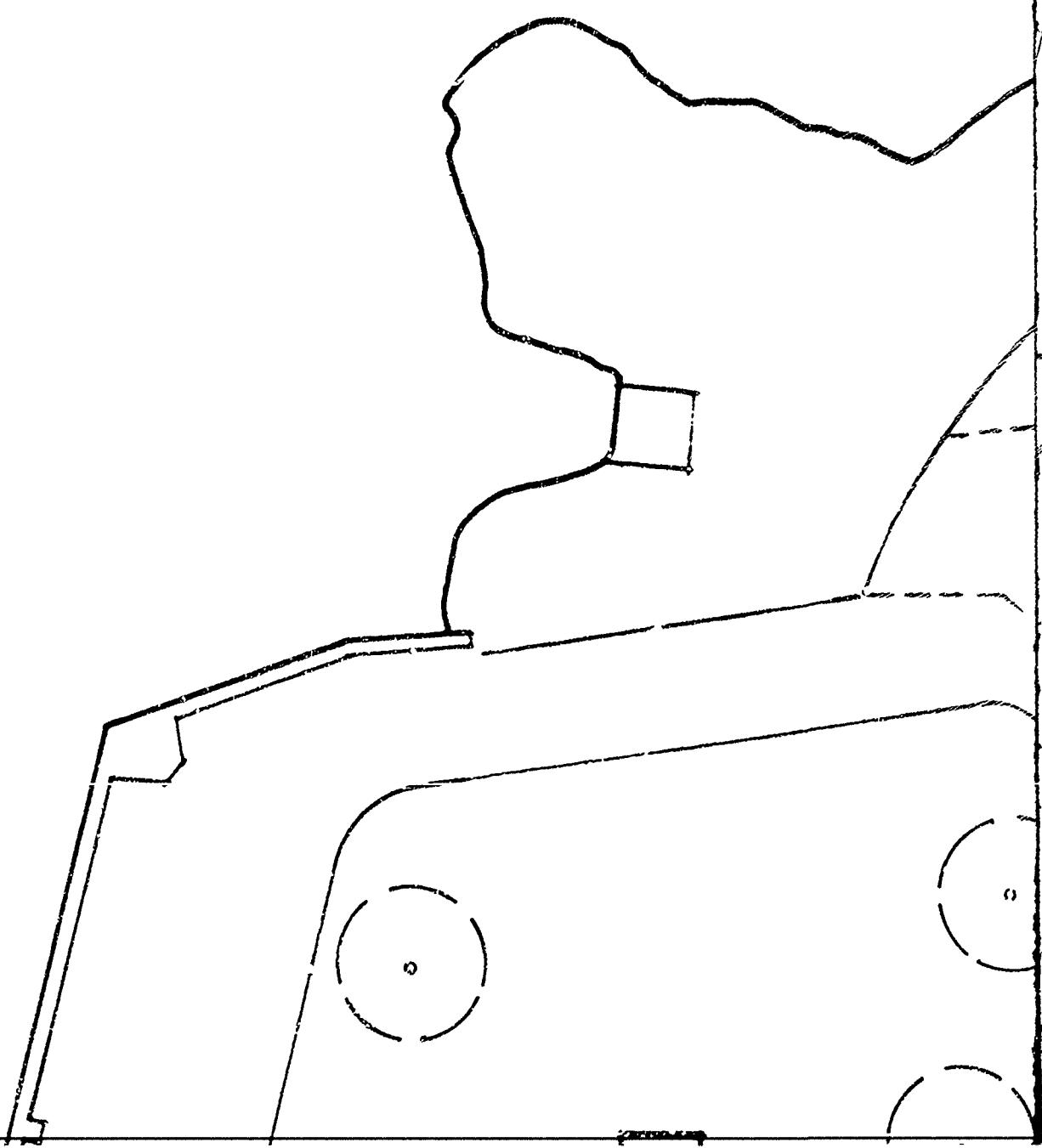
NOAA Ocean Systems Center  
Sheet Three Hawaii Laboratory

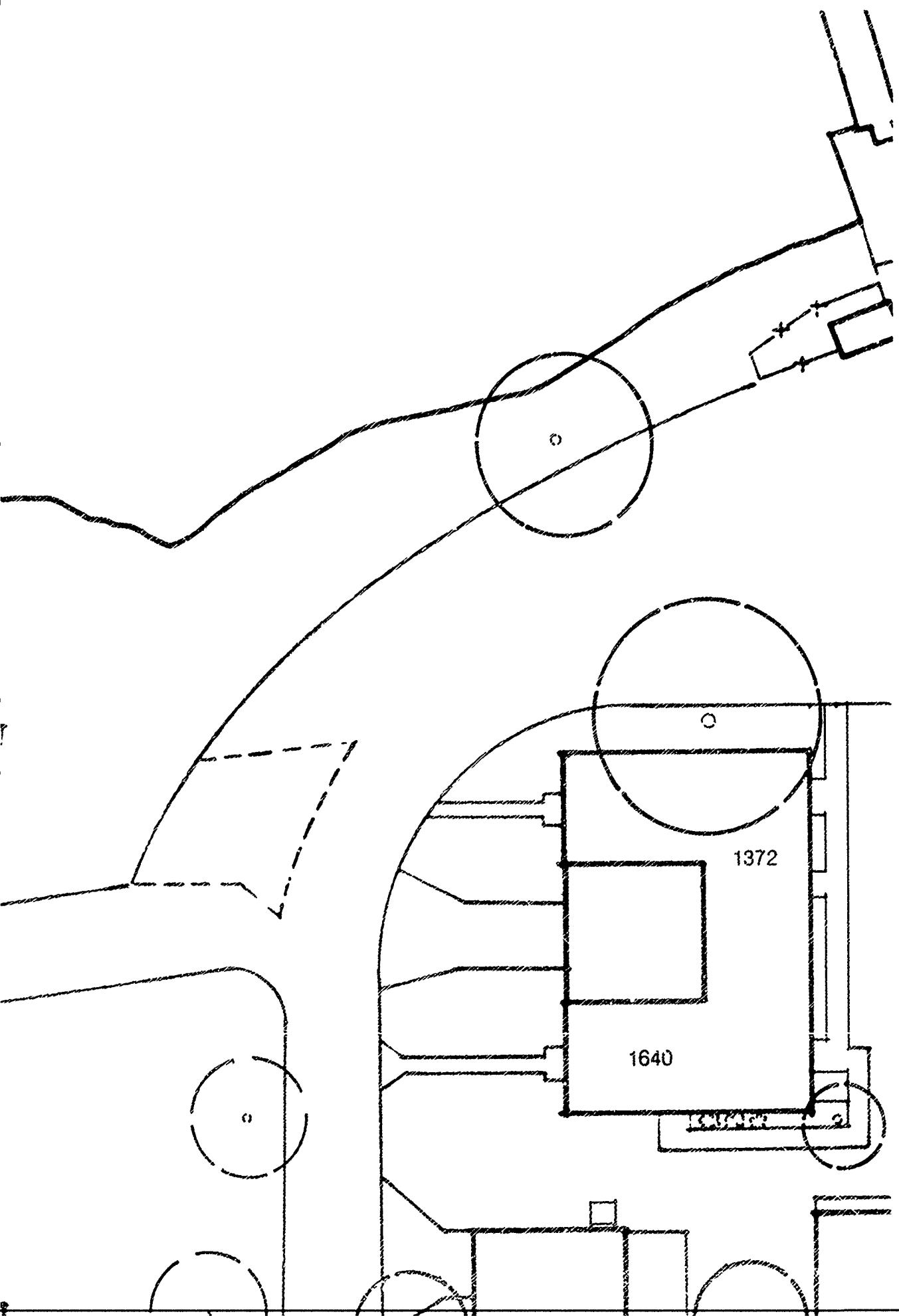
# PLANT MATERIAL SCHEDULE

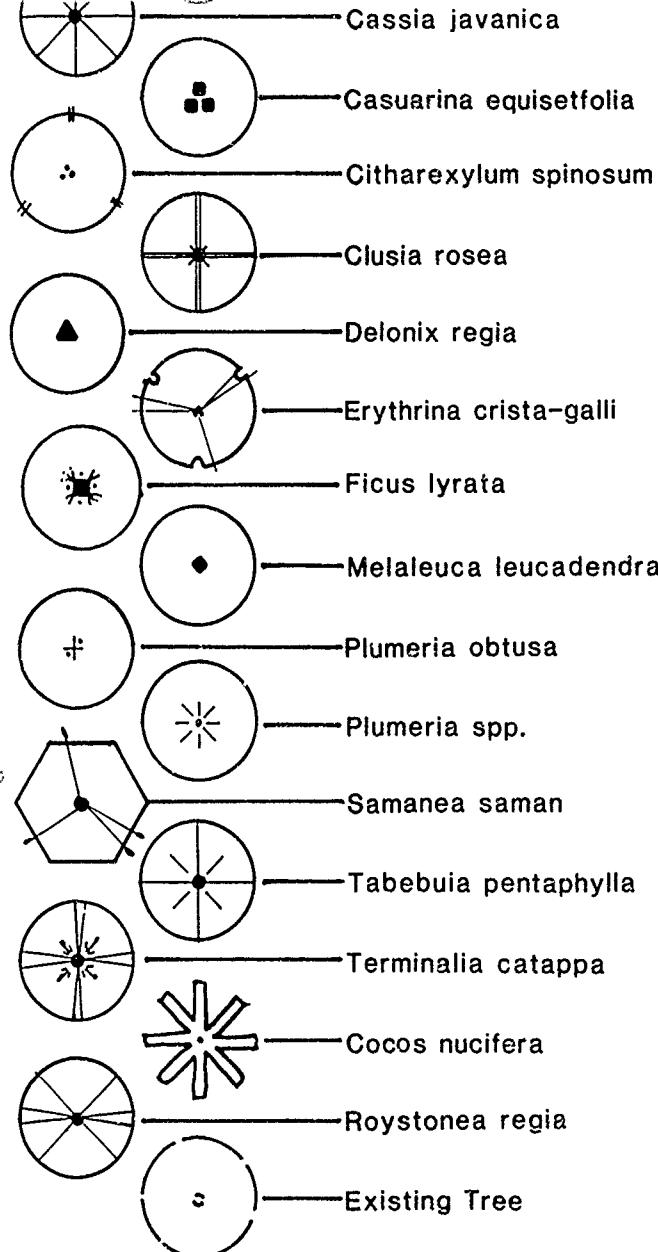
Symbol	Botanical Name	Common Name
	<i>Acacia confusa</i>	Formosa Koa
	<i>Araucaria heterophylla</i>	Norfolk Island Pine
	<i>Calophyllum inophyllum</i>	True Kamani
	<i>Cassia glauca</i>	Kalamona
	<i>Cassia javanica</i>	Rainbow Shower
	<i>Casuarina equisetifolia</i>	Ironwood
	<i>Citharexylum spinosum</i>	Fiddlewood
	<i>Clusia rosea</i>	Autograph Tree
	<i>Delonix regia</i>	Poinciana
	<i>Erythrina crista-galli</i>	Cockspur Coral Tree
	<i>Ficus lyrata</i>	Fiddleleaf Fig
	<i>Melaleuca leucadendra</i>	Cajeput Tree
	<i>Plumeria obtusa</i>	Singapore Plumeria
	<i>Plumeria spp.</i>	Plumeria
	<i>Samanea saman</i>	Monkeypod Tree
	<i>Tabebuia pentaphylla</i>	Pink Tecoma
	<i>Terminalia catappa</i>	False Kamani
	<i>Cocos nucifera</i>	Coconut Palm
	<i>Roystonea regia</i>	Royal Palm
	Existing Tree	

Trees

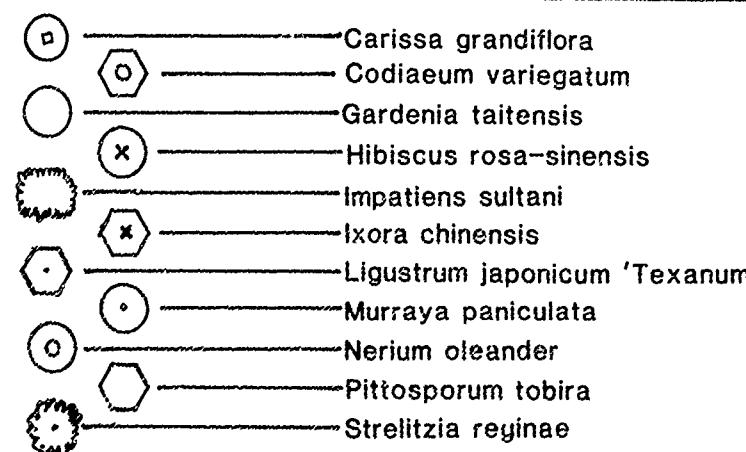
Size	Remarks
25 Gal.	
15 Gal.	
25 Gal.	
5 Gal.	
15 Gal.	
15 Gal.	
25 Gal.	
15 Gal. or 25 Gal.	
25 Gal.	
25 Gal.	
25 Gal.	
25 Gal.	
25 Gal.	
15' B.T.	
15' B.T.	



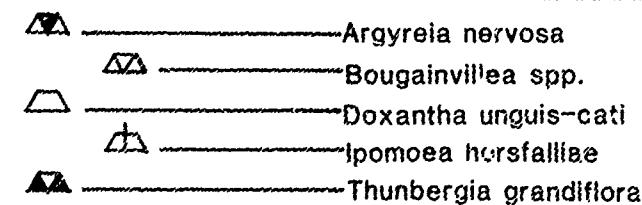




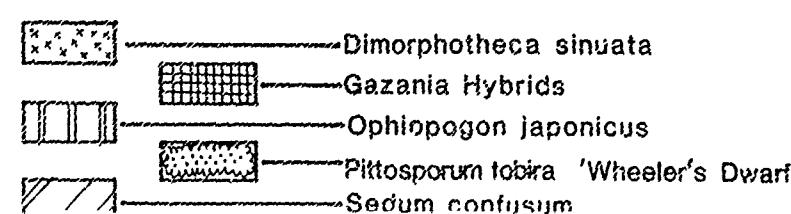
Rainbow Shower  
 Ironwood  
 Fiddlewood  
 Autograph Tree  
 Poinciana  
 Cockspur Coral Tree  
 Fiddleleaf Fig  
 Cajeput Tree  
 Singapore Plumeria  
 Plumeria  
 Monkeypod Tree  
 Pink Tecoma  
 False Kamani  
 Coconut Palm  
 Royal Palm



Natal Plum  
 Croton  
 Tiare Gardenia  
 Hibiscus  
 Impatiens  
 Ixora  
 Texas Privet  
 Mock Orange  
 Oleander  
 Tobira  
 Bird of Paradise



Silver Morning Glory  
 Bougainvillea  
 Cat's Claw  
 Kuhio Vine  
 Moon Flower



Cape Marigold  
 Clumping Gazania  
 Mondo Grass  
 Dwarf Tobira  
 St. John's Wort

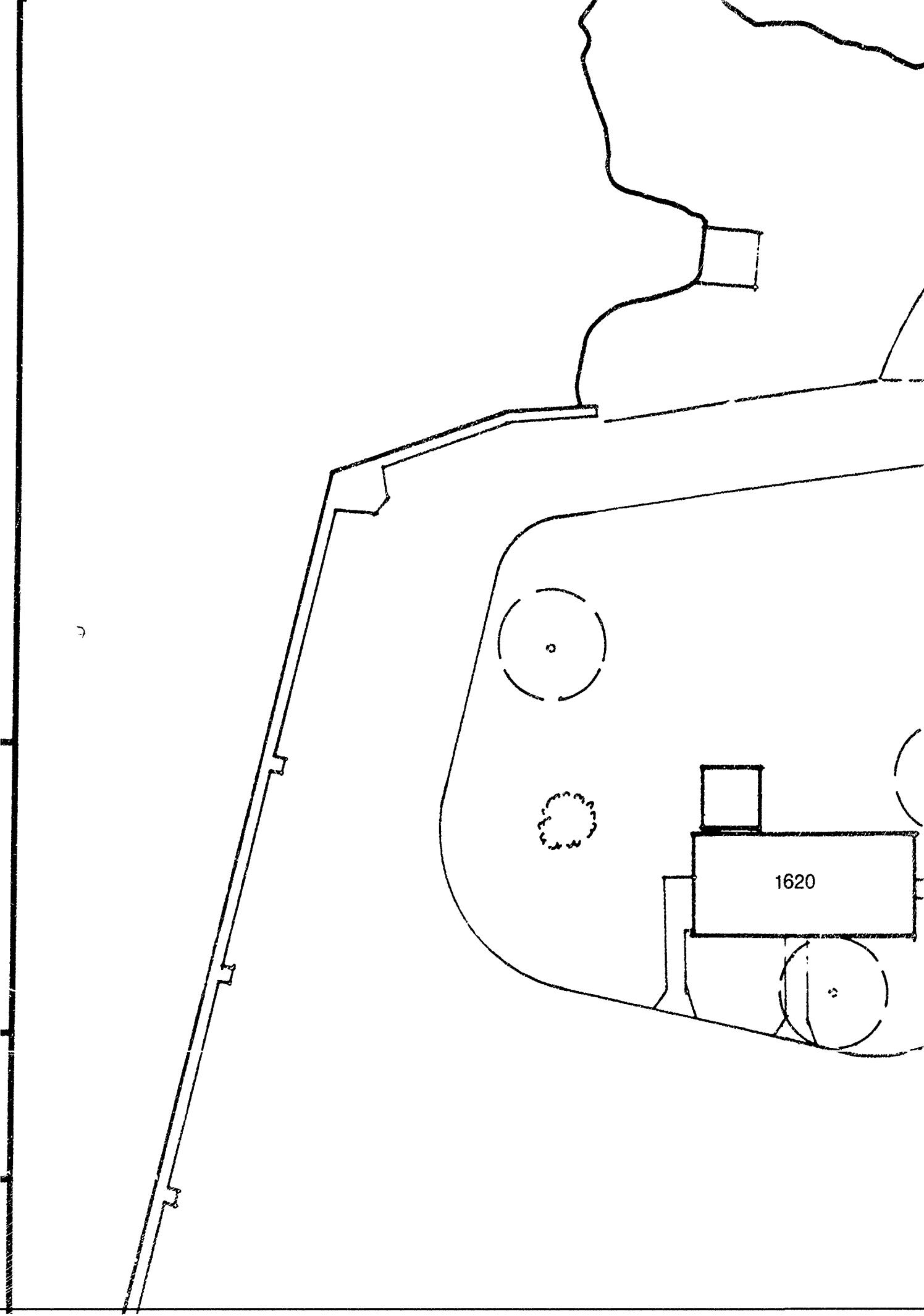
12" o.c.

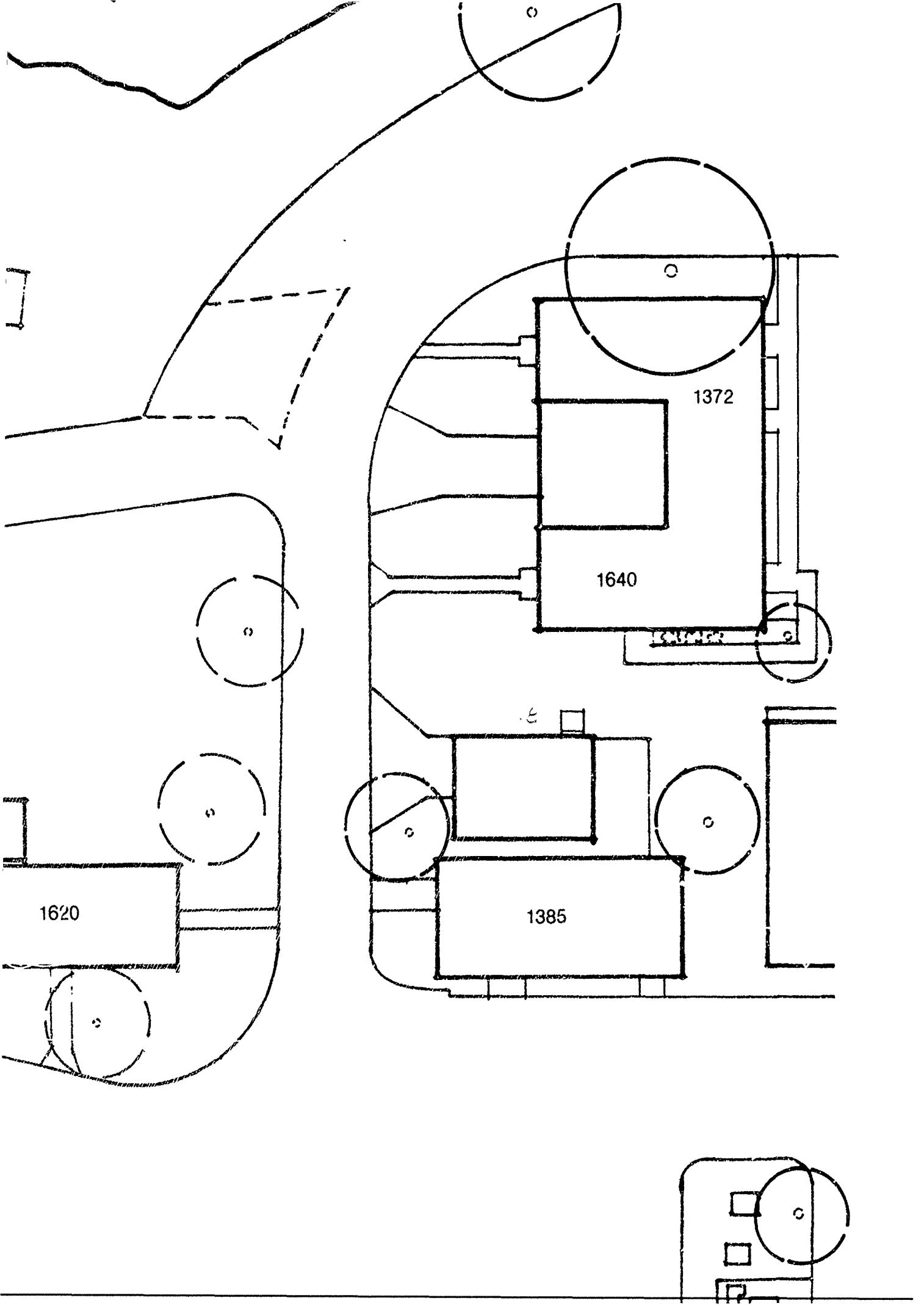
8" o.c.

4" o.c.

18" o.c.

6" o.c.





## Shrubs

	Carissa grandiflora	Natal Plum
	Codiaeum variegatum	Croton
	Gardenia taitensis	Tiare Gardenia
	Hibiscus rosa-sinensis	Hibiscus
	Impatiens sultani	Impatiens
	Ixora chinensis	Ixora
	Ligustrum japonicum 'Texanum'	Texas Privet
	Murraya paniculata	Mock Orange
	Nerium oleander	Oleander
	Pittosporum tobira	Tobira
	Strelitzia reginae	Bird of Paradise

## Vines

	Argyreia nervosa	Silver Morning Glory
	Bougainvillea spp.	Bougainvillea
	Doxantha unguis-cati	Cat's Claw
	Ipomoea horsfalliae	Kuhio Vine
	Thunbergia grandiflora	Moon Flower

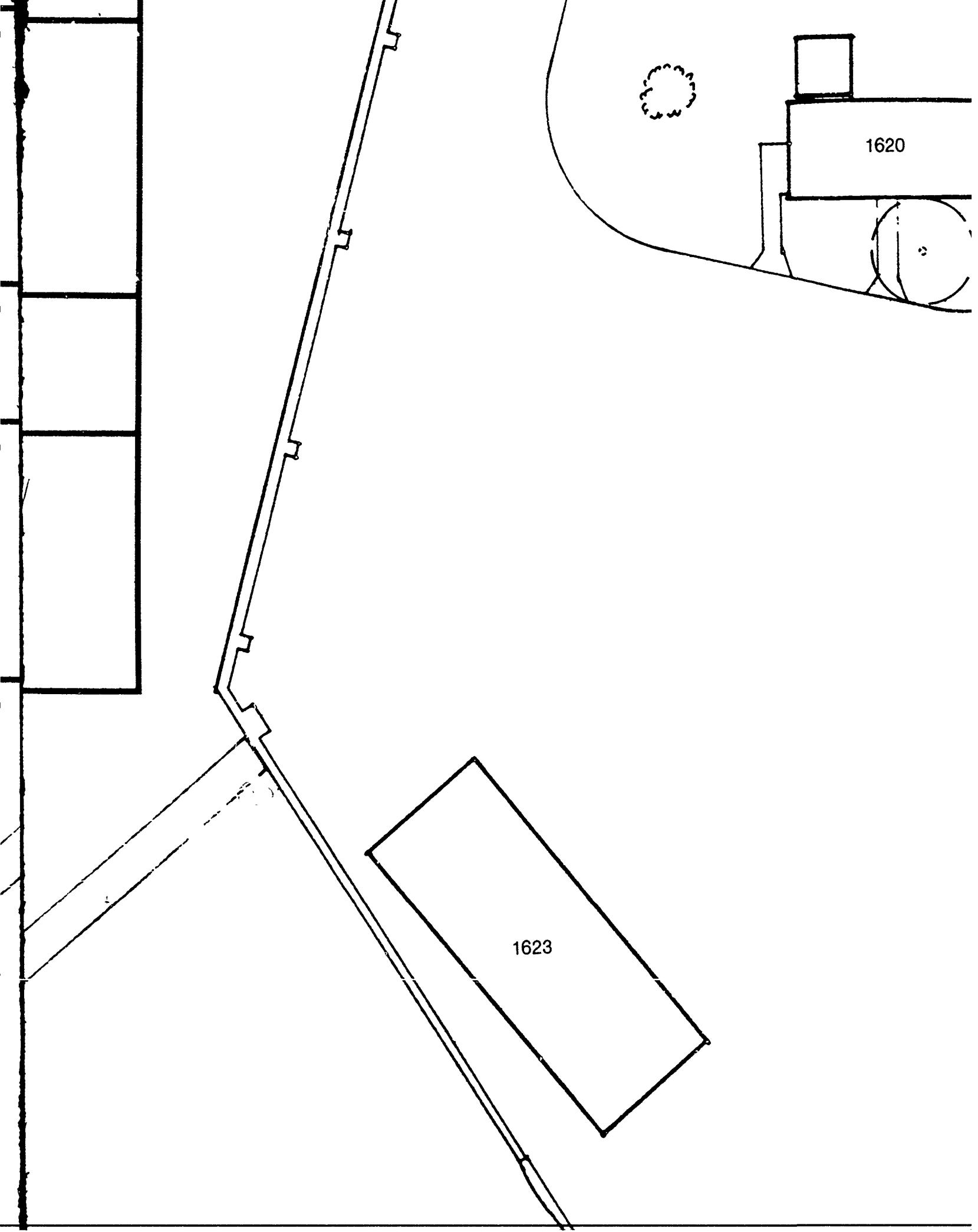
## Ground Covers

	Dimorphotheca sinuata	Cape Marigold
	Gazania Hybrids	Clumping Gazania
	Ophiopogon japonicus	Mondo Grass
	Pittosporum tobira 'Wheeler's Dwarf'	Dwarf Tobira
	Sedum confusum	Stonecrop
	Trachelospermum jasminoides	Star Jasmine
	Wedelia trilobata	Wedelia
	Cynodon dactylon	Common Bermuda
	Stenotaphrum secundatum	St. Augustine Grass

5 Gal.	
5Gal.	
5 Gal.	
1 Gal. or 2-1/2 Gal.	
1 Gal.	
1 Gal.	
5 Gal.	
1 Gal.	
1 Gal.	
2-1/2 to 5 Gal.	
2-1/2 Gal.	

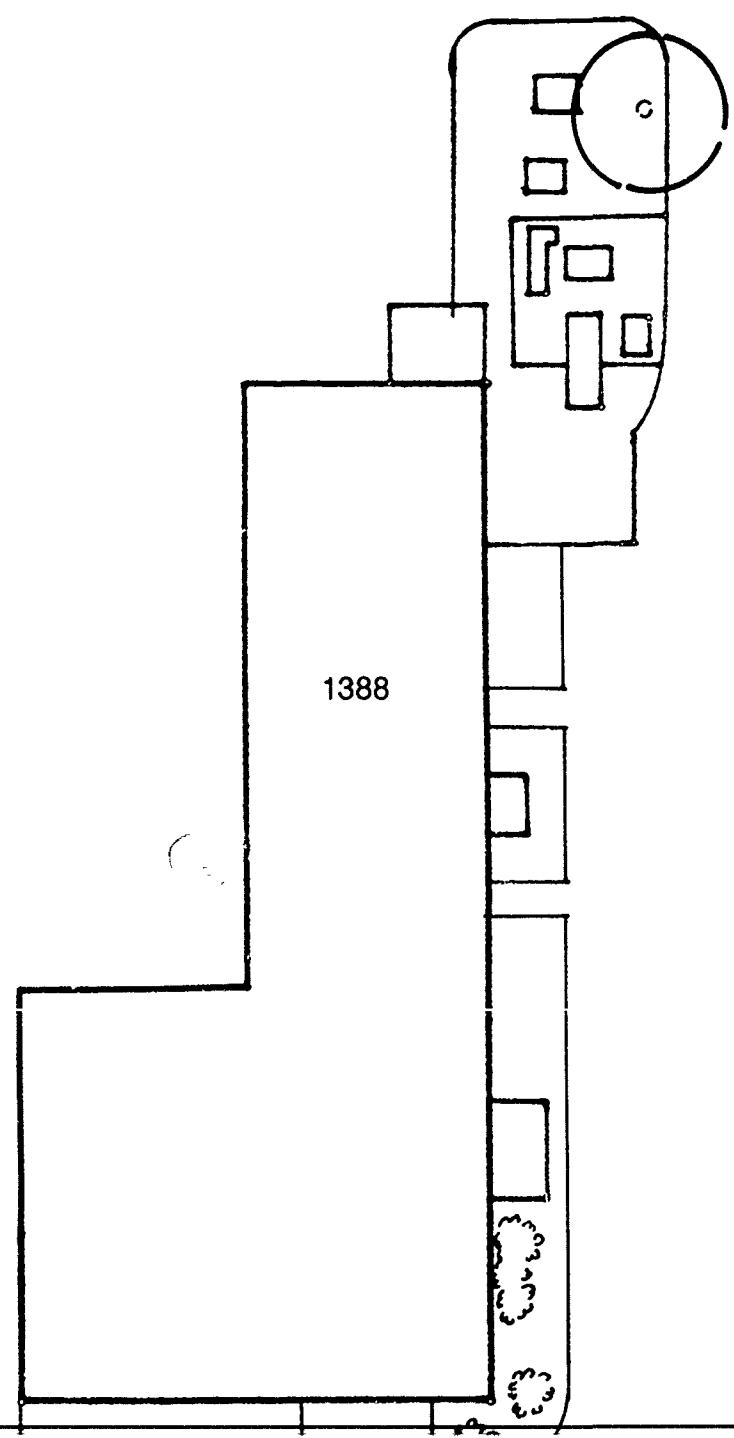
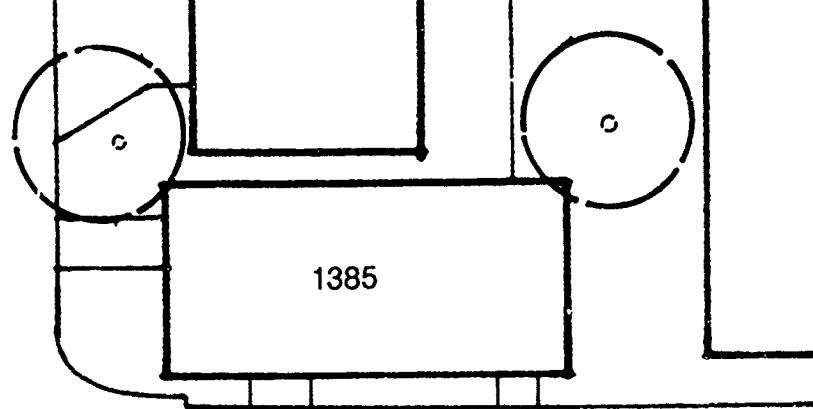
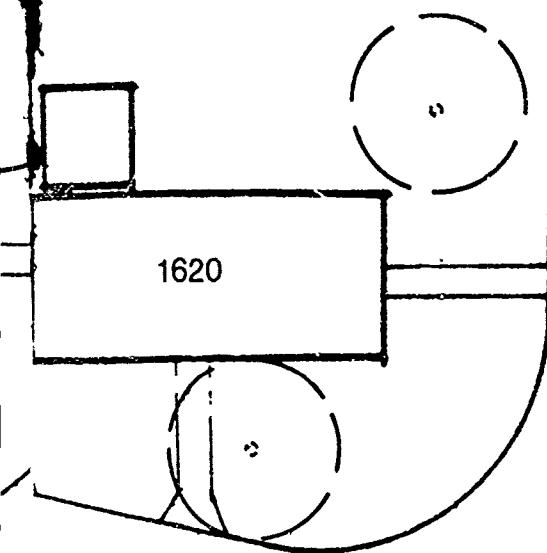
1 Gal.	
1 to 5 Gal.	
1 Gal.	
1 Gal.	
1 Gal.	

4" pots	12" o.c.
Flats	8" o.c.
Rooted sprigs	4" o.c.
1 Gal.	18" o.c.
Rooted cuttings	6" o.c.
4" pot	18" o.c.
Rooted cuttings	1' o.c.
Seeded	
Stolens	4" o.c.

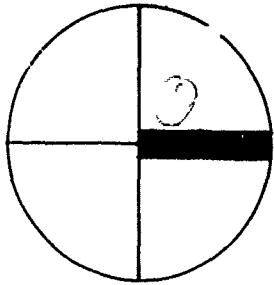


1620

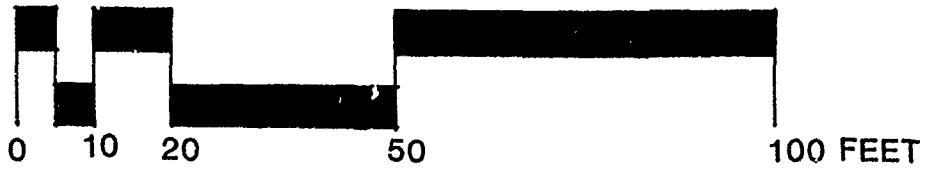
1623



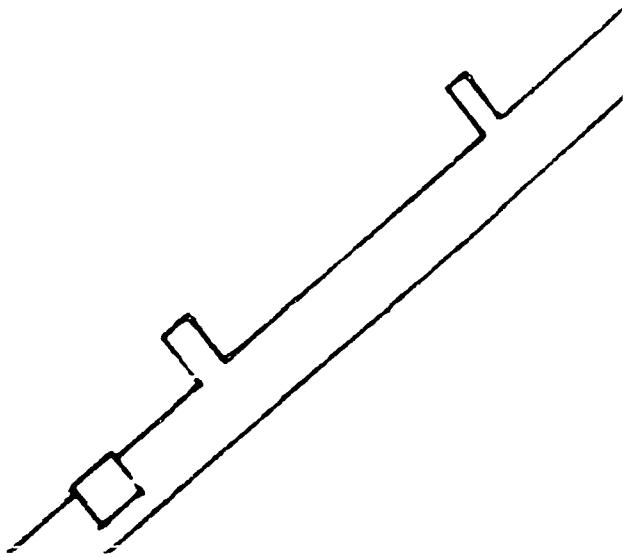
Vines	▲ — Argyreia nervosa	Silver Morning
	▲ — Bougainvillea spp.	Bougainvillea
	▲ — Doxantha unguis-cati	Cat's Claw
	▲ — Ipomoea horsfalliae	Kuhio Vine
	▲ — Thunbergia grandiflora	Moon Flower
Ground Covers	■■■■■ — Dimorphotheca sinuata	Cape Marigold
	■■■■■ — Gazania Hybrids	Clumping Gaza
	■■■■■ — Ophiopogon japonicus	Mondo Grass
	■■■■■ — Pittosporum tobira 'Wheeler's Dwarf'	Dwarf Tobira
	■■■■■ — Sedum confusum	Stonecrop
	■■■■■ — Trachelospermum jasminoides	Star Jasmine
	■■■■■ — Wedelia trilobata	Wedelia
	■■■■■ — Cynodon dactylon	Common Berm.
	■■■■■ — Stenotaphrum secundatum	St. Augustine G



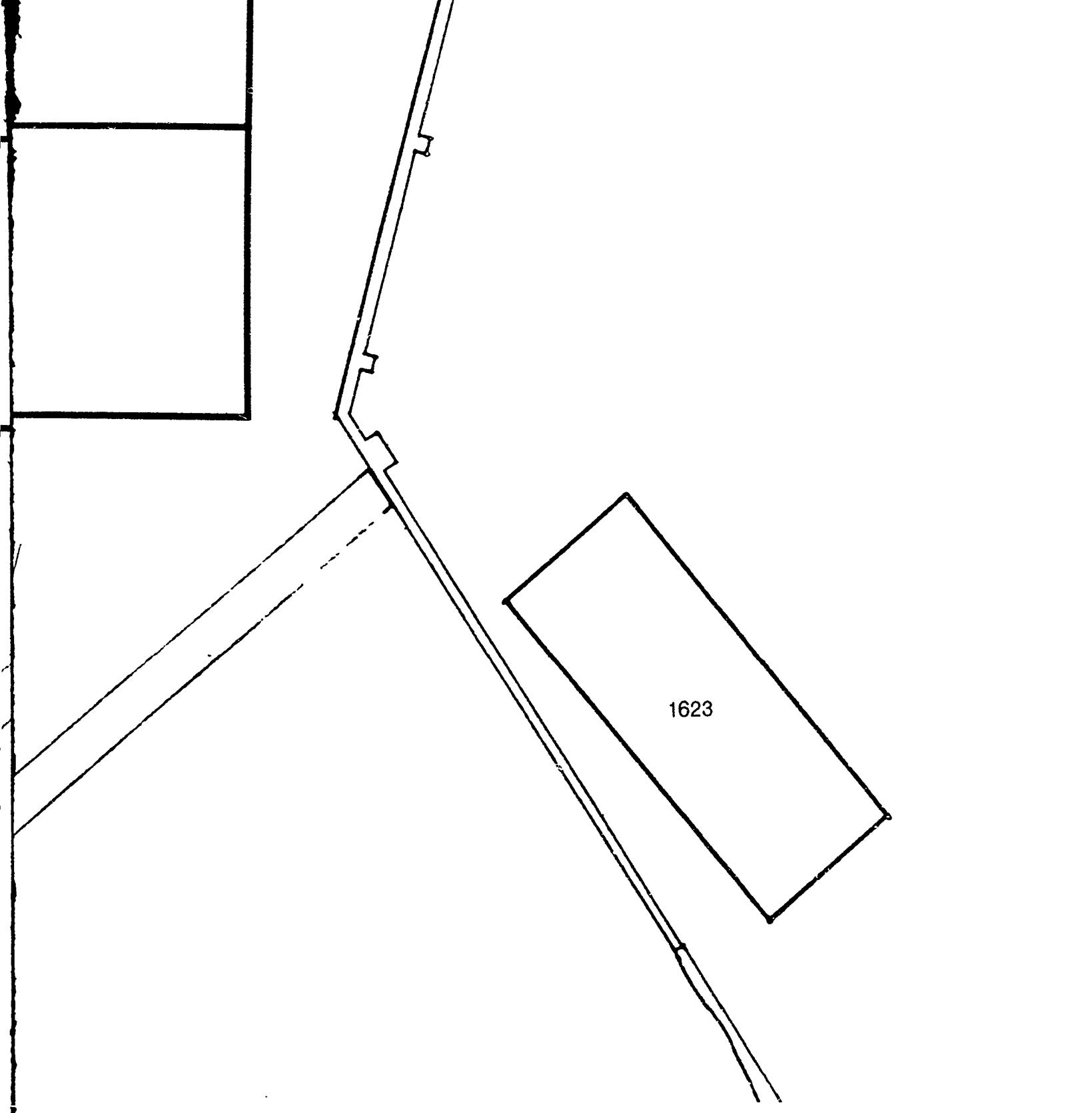
NORTH



	1 Gal.	
	1 to 5 Gal.	
	1 Gal.	
	1 Gal.	
	1 Gal.	
nia	4" pots	12" o.c.
	Flats	8" o.c.
	Rooted sprigs	4" o.c.
	1 Gal.	18" o.c.
	Rooted cuttings	6" o.c.
	4" pot	18" o.c.
	Rooted cuttings	1' o.c.
ja	Seeded	
lass	Stolens	4" o.c.

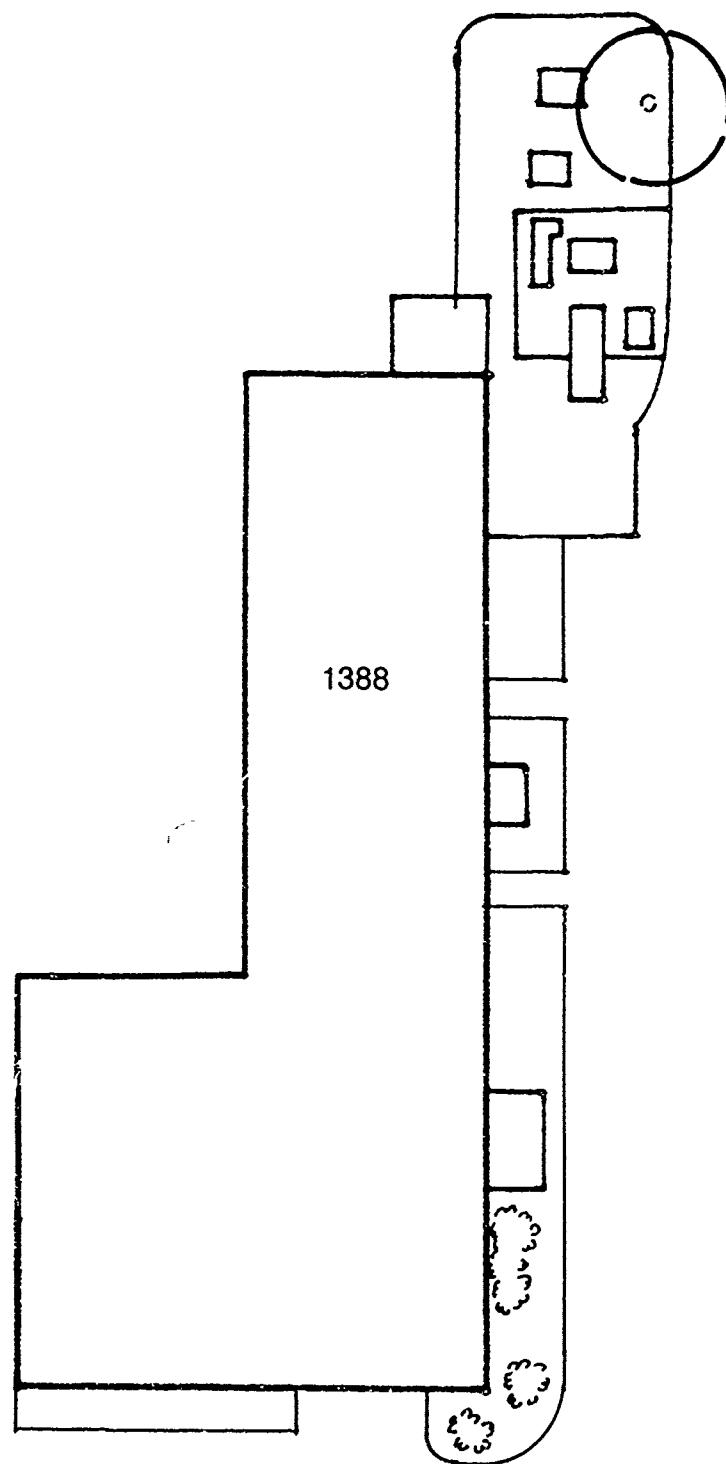


# Landscape Mast



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Naval O



**Ocean Systems Center**  
Sheet Four      **Hawaii Laboratory**